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THE MEANING OF "SERVICE FIRST."

"Service First" means Greater Service, a Greater Number of Subscribers, Greater Harmony and Co-Operation, as well as Greater Efficiency.

A Big Convention in December.

On another page of this issue of TELEPHONY will be found an announcement which will be welcome news to all those who—like TELEPHONY—have urged the policy: "For the good of the telephone business as a whole." It is the announcement that a joint convention of the National Independent Telephone Association and the Independent Telephone Association of America will be held in Chicago, December 8, 9 and 10.

Independent telephone men all over the country will receive this news with pleasure, for it is a most significant indication that these two elements of the Independent field are forgetting their differences and that the way is being paved for one strong national associaton. At the time these differences arose about three years ago, resulting in the organization of the second national association, TELEPHONY strongly urged that a consolidation be effected. It believed that the Independent telephone business was too big and important to be split up into factions; that two associations were unnecessary and, in fact, a detriment to the best interests of the field.

Since that time both associations have had committees working upon the matter of bringing the two organizations together. The decision to hold a joint convention may be considered an important step in that direction.

The report has been widely circulated in some quarters that a combination of the two associations has already been effected. This is without authority and decidedly premature, for the valid reason that such a consolidation cannot be made until the members of each association meet and ratify the proposition. Such a meeting, no doubt, will be held in December by each organization, leading up to the joint convention called for December 8, 9 and 10.

From all parts of the country come reports of the stability of the industry. The business is in an excellent condition, in fact, in some states it never was in better shape than at the present time, and companies operating on a business basis find themselves facing a brighter prospect than ever before.

The harvest season has shown how rich our country is in crops of every description, and the stupendous figures of American agricultural wealth—approximating ten billions of dollars—seem to have restored confidence to a greater degree and accordingly speeded up the wheels in all lines of business.

The men engaged in the telephone industry are sure to share in this revival of good times. In the Independent field, as has been said, the conditions are universally promising.

The attendances at the two separate conventions of the national associations last winter and at all conventions of the state associations were the greatest in many years. The conventions showed that a tremendous awakening was taking place in the Independent field; that the real value of the business was being appreciated and that the men now in it are in it to stay.

The December convention should inaugurate an important era in the history of the movement. Being a joint meeting, it should attract the largest attendance ever seen at a telephone convention. Companies that have never before been represented at a national convention should arrange for some of their officials to attend. It will be money well spent, for the program and exhibits will undoubtedly eclipse those of all previous conventions. The new spirit of Independent telephony which has advocated the slogan, "For the Good of the Telephone Business as a Whole," will be more than ever in evidence. It is the spirit of co-operation and helpfulness and those attending the convention will be more than ever impressed with its possibilities

Own Up Before Your Shown Up

By HERBERT KAUFMAN

Own up before you're shown up. Wrong men are never strong men; crooked things can't grow high.

Common sense is always efficient. Honesty is an economical policy; it's the shortest cut; the safest road—the quickest route to anywhere and thing.

Pretense inevitably entails defense. The cost of guarding an unsavory episode eventually exceeds the profit derived therefrom.

Some cheats evade detection, but none escape reflection. Conscience, the nag, knows what's wrong. A secret soon becomes an old man of the sea—its weight increases with the waiting.

Every tongue finally forgets itself; you're bound to seek relief—sure to confide in somebody and "somebody" is certain to betray you.

Traits can neither be covered nor recovered, and once your career is investigated, the hundred and one foolish and futile moves made to conceal your original "error" will be brought to light. You can find an excuse for an impulsive deed, but the cloak of charity is never broad enough for deliberate, cold-blooded deceit.

Be frank while opportunity is yet patient. We're more than ready to believe that you are sorry if you volunteer the truth—when you're discovered we can only believe you are sorry you were caught.

Everybody is impulsive, neglectful, bad-tempered. None of us is so well balanced but what circumstances can at times prove too powerful for resistance. There are moments when we all are or do wrong, but concealment of a mis-step turns it into a mis-deed.

Bad arithmetic isn't criminal, but when you juggle accounts to bury incompetence you become one. Dereliction of duty is simply carelessness, but failure to proclaim the evasion brands you a sneak.

The best of citizens occasionally miss the beaten track, but when we don't retrace and we don't replace, we cancel the right to respect and confidence. The utmost that the foremost can strive for is an excellent record. One hundred per cent. men do not exist. Omniscience and omnipotence are not of the earth.

Don't be an ass. The lion's skin isn't a disguise—it's an advertisement. Your very pose of perfection is the first thing to arouse our suspicion. The man who never makes an error is so abnormal that he draws attention upon himself.

As old Cyrus Simmons used to say to his men: "It's your right to be wrong but it's my right to know it. Come to me before I go to you. Only the Almighty is perfect and He isn't on my pay-roll.

"When I hired you I made an allowance for human frailty. If wheels of steel and belts of leather can't be relied on, it's reasonable to discount the performances of a machine built of meat and bone. When you break a rule, tool or commandment, tell me before it breaks you.

A man, like a boiler, is dangerous without a safety valve. So long as I am sure that either will signal in time, I am safe."

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JOINT CONVENTION OF NATIONAL ASSOCIATIONS, CHICAGO, DECEMBER 8, 9 AND 10.

At a meeting of the officers of the Independent Telephone Association of America and the National Independent Telephone Association held at the Hotel La Salle, Chicago, October 18, it was decided to hold a joint convention of the two associations December 8, 9 and 10 at the Hotel La Salle.

The National Independent Telephone Association had already announced a convention for these dates. It extended an invitation to the Independent Telephone Association of America to join in the convention and make it the greatest and best in the history of telephony. This invitation has been accepted. The two great national associations have perfected plans for bringing together at this convention representatives of all branches of the telephone industry, and to present a practical program for every man in every department of every telephone plant.

This joint convention ought and certainly will bring together the largest number of Independent managers that has ever attended a national convention. The full strength of the industry will be evidenced.

Realizing the opportunity thus afforded, all manufacturers and dealers in Independent apparatus and supplies will make more than their usual effort to attract the trade by exhibits and representatives.

Everyone will be benefited. Everyone push for the big convention December 8, 9 and 10!

Move for Merger of the Two National Associations

Steps Being Taken toward Merger of National Independent Telephone Association and the Independent Telephone Association of America—Joint Convention of Two Bodies Will Probably Determine Success of Move—A New Association Likely

While no definite announcement can be made at this time, the indications are that the plans looking toward the consolidation of the Independent Telephone Association of America and the National Independent Telephone Association will result successfully within the next few weeks.

As stated in the official bulletin issued by Secretary F. B. MacKinnon, printed on this page, the two organizations will hold a joint convention in Chicago, December 8, 9 and 10. None of the officers or directors of either association feels at liberty at the present time to discuss the matter in detail or make any prediction, for the reason that it requires official action by the membership to change the status of the association, and that cannot be had until a convention is held. The belief is held, however, that a consolidation will probably be made and that a strong organization will be formed in which all Independent telephone men will have a home, feeling and knowing that they are factors in a united movement for the good of the telephone industry.

Word comes from the secretary of state's office at Springfield, Ill., that plans are afoot for the incorporation of the United States Independent Telephone Association, which is expected to absorb both the existing associations. The names of the men mentioned in connection with this new organization include those who have been prominent in both associations—C. Y. McVey, Cleveland, Ohio; Geo. W. Robinson, St. Paul, Minn.; A. G. Bean, Elyria, Ohio; H. D. Critchfield, Chicago; W. S. Vivian, Chicago; A. F. Adams, Kansas City, Mo.; and F. B. MacKinnon, Washington, D. C.

President E. B. Fisher and Secretary Vivian, of the Independent Telephone Association of America, are in San Francisco, in attendance at the convention of that organization. Other directors of this association begged to be excused from making any definite statement regarding a consolidation. It is a matter of record, however, that both associations have had committees at work for some time on a plan for a union, and men in both camps are hopeful that it will go through.

The most that President C. Y. McVey, of the National Independent Telephone Association, would say regarding the matter was that a joint convention of the two bodies had been called for December 8, 9 and 10, and that the outlook was favorable for an agreement. Secretary F. B. MacKinnon is in Washington, and would add nothing in the way of comment to his announcement of the joint convention.

Although TELEPHONY always sincerely wished Godspeed to any movement or enterprise intended to further the welfare of the telephone industry, honesty compelled this journal to advise the early consolidation of the two Independent associations. On the ground that "In union there is strength," TELEPHONY, from time to time, has advocated the combination of the two associations for the good of the field. December 6, 1913, in an editorial entitled "The Independents' Opportunity," TELEPHONY said:

"As TELEPHONY has always contended, there should be only one Independent association, and that should be a strong, aggressive organization, big enough and broad enough to include in its membership all men who believe in locally-owned telephone systems, and who will co-operate towards wider use of the telephone. The cold fact is that there is not enough real difference between the avowed principles of the two associations now in the field to warrant their operating as two separate and distinct units. Ostensibly, at least, both associations are working toward the same end.

The men prominent in the councils of both associations are in the same business. All wish to see the telephone question settled and settled right. They are interested in having the telephone business placed on a solid basis—a basis which the government must establish, and which will mean the preservation of the rights of Independents.

No one will deny that, working together, the two associations can increase their effectiveness many fold. The fable of the bundle of faggots has special application in this instance. By concerted action, Independent telephone men can do much to insure their interests being protected; divided, they can but hinder themselves, work at cross purposes, and make it easier for the opposition."

On the eve of the two national conventions held by the two organizations in 1914, TELEPHONY said:

"Coming only a week apart, these two conventions should

be utilized by Independents in trying to bring about a consolidation of the two associations. Both have avowed the same purpose—the development of the Independent telephone industry. Surely a platform with this end in view, broad enough for all to stand on, can be adopted. Why divide forces when more effective work can be done by one united organization?"

December 20, 1913, another editorial stated:

"As pointed out before, there should be little room for differences between these two organizations. They profess to have a common end in view. Both associations are led by men who have large investments in the Independent telephone business, and who desire its permanent success. Common sense, therefore, would seem to argue strongly for a union of the two organizations the better to work out their mutual salvation."

Telephone manufacturers and supply houses will be pleased if the consolidation plans succeed. They have contended that one strong, united association could do better work than two separate bodies. It has been no small burden for the manufacturers to exhibit at two conventions, and the joint convention plan has met with their hearty approval.

In January of this year, the Independent Telephone Association of America held its national meeting at Minneapolis, Minn., and it was a great success. February 3, 4 and 5 the National Independent Telephone Association held its convention in Chicago, and had a big turn-out.

By consolidating the two meetings this year the Independent telephone interests should have a record-breaking event in Chicago. Every one connected with the industry should do his part to make the December meeting a big success.

Illinois Supreme Court Decision Upholds Mutual Company

Sangamon County Circuit Court Affirming Order of Commission in Exercise of Authority Over Bethany Mutual Telephone Association, Reversed—Franchise to String Wires Along Streets Does Not Make Organization a Public Utility Under Illinois Law

The fact that a telephone company has obtained a franchise to string its wires along the streets of a city, or village, does not necessarily make it a public utility under the meaning of the Illinois public utilities act. This is an important point decided by the Illinois supreme court in a decision handed down October 27 at Springfield in the case of the State Public Utilities ex rel. the Macon County Telephone Co., appellee, vs. the Bethany Mutual Telephone Assn., appellant.

On petition of the Macon County Telephone Co., the Illinois Public Utilities Commission ordered the Bethany Mutual Telephone Association to cease from constructing or maintaining its telephone system in Bethany and vicinity because it had not obtained a certificate of public convenience and necessity. The Bethany company contended that it was not a public telephone company and did not propose to engage in the telephone business or construct its system for public use, and it denied the jurisdiction of the commission.

The case was appealed to the Sangamon county circuit court which affirmed the order of the commission. From that judgment the case was appealed to the supreme court.

Under the charter granted the Bethany company, it has no authority to engage in public service or to devote its property to public use. Discussing the case the opinion of the supreme court, which was written by Justice Cartwright, says:

"Aside from the statutory definition, the term 'public utility' implies public use, carrying with it the duty to serve the public and treat all persons alike, without discrimination, and it precludes the idea of service which is private in its nature, whether for the benefit and advantage of a few or of many. The question of the nature of a corporation cannot depend upon the number of persons engaged in the enterprise for their mutual benefit, but the nature of a corporation and the purpose for which it is organized must be ascertained by reference to its charter.

The purpose for which the appellant, the Bethany Mutual Telephone Association, was incorporated, as stated in its application for incorporation and in the certificate of incorporation by the secretary of state, was 'for the private use of the members of said association only, for the purpose of telephonic communication between them, for their private and community interests and not for the pecuniary profit of any person or persons connected with the said association and not for the profit of any stockholder interested as owner of any interest in said corporation.' By the charter the use of the telephone system is limited, strictly and solely, to the members of the corporation and it has no authority under its charter to erect or maintain any telephone lines for the service of the public. It can only exercise such powers as are within the scope of its charter and none other.

The telephone company was held in Illinois Public Utilities Commission vs. Noble Telephone Co., supra, to operate a public utility because its lines connected with country lines and other exchanges in Richland and surrounding counties and it obtained and enjoyed a license conditioned that no person should be barred from membership and use of its lines. In Buncombe Telephone Co. vs. McGinnis, 268 Ill., 504, the corporation had a central station connecting with the various county lines and with the local village system and long distance lines, and the object stated in the application for incorporation was for 'telephone purposes and to legally establish our rights on public and private property with poles, wires and necessary equipment,' which denoted an unlimited public use.

It is argued that the property is used or to be used for a public use because the appellant has obtained a license from the village of Bethany to construct, maintain and operate telephone poles, wires and fixtures in the streets of the village and has purchased a great quantity of poles which it intends to erect on the public highways and to string wires on them. These matters neither concern the petitioner nor the state public utilities commission, and do not fix the character of the corporation. If poles or wires should be placed on streets or highways, it would no more tend to prove that the use is public than the fact that farmers driving on the public highways with their own products would tend to prove they are common carriers. If constructing a telephone system in streets or highways for private use is a diversion of the streets or highways from their legitimate use, the commission would not thereby acquire jurisdiction over the appellant.

The commission has no jurisdiction to make an order concerning the appellant and the judgment of the circuit court affirming the order of the commission is reversed.

Michigan State Completes Improvements at Port Huron.

The Michigan State Telephone Co. has completed $15,000 worth of improvements at Port Huron, Mich. The work included the construction of two submarine cables across Black River at that point and the extension of service in suburbs.

Independent Telephone Convention at San Francisco

Independent Telephone Association of America Holds Meeting in Exposition City—"Service First," Slogan of Convention—Interesting and Instructive Papers Presented at Morning Sessions—Afternoons Devoted to Exposition and Side Trips—Report of Proceedings

The convention of the Independent Telephone Association of America opened at San Francisco, Cal., on Tuesday morning, October 26. There was an attendance of about 100 persons of whom about 80 were from the Western states, the others coming on the special train from the East, which arrived on schedule time. The motto of the convention was "Service First."

The convention was opened at the Civic Auditorium, just completed to commemorate the Exposition, by an address of welcome to California by E. P. Morphy, of Los Angeles, to which President E. B. Fisher, of Grand Rapids, Mich., responded in behalf of the association.

T. A. Gould, general manager of the Redondo Home Telephone Co., of Redondo Beach, Cal., then read an interesting paper on "Commission Regulation from a Class 'C' Standpoint." Mr. Gould touched upon the experiences of his company in complying with the requirements of the accounting system prescribed by the Interstate Commerce Commission. Physical connection, he said, is another important phase of the telephone business under the jurisdiction of the state commissions. He discussed the feasibility and practicability of physical connection for competing plants, as well as for toll and long distance connections. Mr. Gould also took up the question of so distributing the expense of physical connection that subscribers, for the different classes of service, will pay their pro rata share of the cost.

In concluding, he stated his belief that physical connection along the lines suggested and under the protection of the state and federal commissions, will enable many small Independent operators to protect their investments and give the people the continued blessing of the Home telephone service they so much appreciate.

A talk by E. E. Daicey, of South Bend, Ind., on "Service First" concluded the morning's program.

The afternoon was taken up with a steamer trip on San Francisco Bay, viewing the Golden Gate and the grounds of the Panama-Pacific International Exposition.

Wednesday Morning Session.

The Wednesday morning meeting opened with an address by President Fisher on the "Past, Present and Future," after which Chas. E. Sumner, president of the San Diego Home Telephone Co., of San Diego, spoke on "Proper Relations Between Municipalities and Public Utilities." Mr. Sumner explained his profit-sharing plan with the public, the details of which have been given in previous issues of Telephony, and told of what he had done in the past and hoped to do in the future in San Diego.

Albert Schuler, general manager of the Home Telephone Co., of Santa Barbara, spoke on "The California Cable Bug" and the damage caused by the bug to his cables. He captured a bug but it escaped out of the lead box it was in. He afterward enclosed the lead box in a glass jar and brought several bugs and exhibited them at the meeting. Mr. Schuler estimates that this bug causes the Santa Barbara company a damage of $600 a month and he is working on schemes to destroy the bug. Where the English sparrow exists, Mr. Schuler stated, no damage is caused by the cable bug.

"Necessity of Co-operation" was the title of the subject assigned to A. Wardman, secretary and manager of the Whittier Home Telephone & Telegraph Co., of Whittier, Cal. Mr. Wardman, however, enlarged his topic to include "Co-operation of Our Public Utilities with the Various County and City Officials and the Public in General, with Reference to the Planting and Care of Trees on Public Highways." He first told of the difficulties encountered in pole line construction due to tree interference. As a remedy he suggested the regulation of the species of trees planted along public highways and co-operation with the road commissioners or others in charge. In conclusion he advocated that the state commission be given jurisdiction over trees along public highways. Mr. Wardman's paper appears on other pages of this issue.

A special meeting was held Wednesday afternoon in Festival Hall on the Exposition grounds. Commissioner Vogelsang welcomed the Independent telephone men to the Exposition and presented to the association a bronze plaque, suitably engraved in commemoration of the event. An able response on behalf of the association was made by President Fisher.

Thursday Morning Session.

The session on Thursday morning opened with the presentation of a paper on "Efficiency or Inefficiency, Which?" by Chas. A. Rolfe, president of the Southwestern Home Telephone Co., Redlands, Cal.

"Thorough, perfect organization," Mr. Rolfe said, "is absolutely essential before any approach can be made toward efficiency. It follows naturally that all along the line of employes, from president to messenger, there must be loyalty and co-operation, not forced, but natural and interested co-operative work. The principal and strongest asset of a public utility is in my opinion good service and satisfied patrons. Good service is efficiency called by another name and bad service another title for inefficiency."

The burden of efficiency, Mr. Rolfe contended, rests on the official head of the utility, and if he knows and is true to his business, efficiency always follows. He also called attention to the important part the telephone plays in everyday life. "Our mission," he said, "is to furnish good service, not at stated intervals, but all the time, every minute in the 24 hours, constant and unfailing service."

Mr. Rolfe contended that the inefficiency of the government postal service contributes a great amount of business to the telephone and telegraph companies. "In government operations," he went on to say, "our subject is exactly fitting—'Efficiency or Inefficiency, Which?' My experience and observations answer, inefficiency."

The Southwestern Home company, he stated, operates in the most sparsely settled part of Southern California, in a territory of 2,800 square miles. It has one telephone per square mile and for each ten persons. The company has six exchanges, the main office serving an area of 650 square miles. Two exchanges serve an area of 1,000 square miles, another an area of 400 miles; and the others respectively 350, 250 and 150 square miles. "The service," he stated, "is efficient and we dwell in peace without annoyance or complaint. The result attained solves which is the better, efficiency or inefficiency."

Mr. Rolfe concluded his paper with the following bit of rhyme:

He serves the public best
Who puts complaint to rest,
And looks the public in the eye,
And tells them that's the reason why.

The matter of efficiency and inefficiency was then discussed from all angles, after which "Operating" was well presented by Secretary W. S. Vivian, of Chicago.

Mr. Vivian's talk was followed by an address by Ernest Irwin, of the Southwestern Home Telephone Co., Redlands, Cal., on the operation of telephone systems in Southern California. It was a practical talk and was well received.

Thursday afternoon the delegates and visitors to the convention were taken on a trolley trip through Oakland, Alameda and Berkeley, visiting the University of California, the famous Greek Theater and Idora Park. In the evening a trip was made through Chinatown.

Friday was occupied by an eight-hour trip to Mt. Tamalpais on the crookedest railroad in the world.

The manufacturers represented with exhibits were as follows: Kellogg Switchboard & Supply Co., Chicago; American Electric Co., Chicago; Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y., and the National Carbon Co., Cleveland, Ohio.

Results of Central Home Efficiency Contest.

With ten months of the year gone the Central Home Telephone & Telegraph Co. is entering on the next to the last lap on a basis that, with present prospects, promises to see the year finished in the 100 per cent. time that the "I Told You So" club has set for its mark. The first three quarters, ending on September 30, show an average collections record of 97.7 per cent., a considerable number of the exchanges reporting that they did not have one single dollar payable and unpaid. The same nine months a year ago, when the Central Home company finished with better than 100 per cent. collections, showed a collections average of 98.4.

Apparently the company is not up to the same mark as at this time a year ago, but the figures are deceptive. As a matter of fact collection efficiency campaigns become more difficult as they continue, for the reason that the past due accounts are being eliminated all the time. Though they help the total at the outset, as they disappear, they leave the exchange and branch managers only current accounts to clean up on. Another element in this connection is that the showing for the first three quarters is made in connection with general increase in business, showing not less but really better efficiency than was the case at the end of a similar period a year ago.

Meanwhile the officers of the company, S. M. Heller, general manager, and W. M. Brown, general auditor, are continually urging that the men at the head of the various branches exert themselves to the utmost to keep collections up. Not a day passes but Mr. Brown sends out a circular letter to the various managers, written either by himself or by Mr. Heller. Sometimes these letters relate to some concrete item and sometimes they speak of efficiency in general terms. Every angle on the subject is provided for. A characteristic letter was very brief, contained an introductory line or two and presented the following quotation for the managers and those under them to think about:

"Opportunity is like a pitched ball. The time to hit it is before it passes the plate."

If the efficiency campaign of the company were directed solely toward 100 per cent. collections it would be much simpler and a much easier proposition to work out. However, collections constitute only a part of the whole, efficiency including plant and operation, new business, etc.

Prompt Action of Operators Saves Man's Life.

To the prompt and intelligent action of two operators of the Texas Telephone Co. at the Waco, Texas, exchange, Raymond Sammons, a railroad man, probably owes his life. Mr. Sammons, working in the railroad yards at Waco, was caught between an engine and cars late one afternoon, and his left arm badly mangled.

A man in an office nearby, seeing the accident, called "Central" and asked for a quick connection with the city hall to report the accident. Miss Myrtle Dickinson, the operator who took the call, immediately notified her supervisor, Mrs. James Kent, of the urgency of the call. The supervisor promptly called Dr. Colgin, the Katy physician, who "listened in" on the city hall connection, quickly ordered the injured man taken to the hospital, and by telephone arranged for his immediate attention. Mr. Sammons was being treated at the hospital within ten minutes after the accident, and will recover. He owes his life to the prompt attention.

A Growing Mutual Company in Southern Iowa.

The Clark County Mutual Telephone Co., of which O. R. Shaw is secretary, has been operating an exchange since May 1, 1914, at Oscelo, Iowa, and now has 425 telephones in service in the city and 520 rural telephones. The company has a Kellogg common battery switchboard with 300 lines installed and 40 magneto lines. It has a paid up capital stock of $12,000. Toll lines are being built to reach some of the neighboring towns. These lines are being built sufficient to rent pin space to the farm lines and have them come in on the same line of poles. "We are growing and expect to grow, as we have a lot of good business men backing the institution and a host of friends," Secretary Shaw states. "As this is a strictly 'Home' institution, it deserves the patronage of the county, and we are getting it."

Rate for Common Battery Service at Rice Lake, Wis.

The Wisconsin Railroad Commission on October 19, granted the application of the Barron County Telephone Co., of Barron, to discontinue magneto local service at its Rice Lake exchange and to furnish only common battery local service at the rates now on file with the commission.

The rates for common battery service which become effective at such time as the company places the equipment in operation, are: Business, one party, $2.50; residence, one-party, $1.50; business, two-party, $2; residence, two-party, $1.25; residence, four-party, $1; business and residence extension, 50 cents each. The company expects to have the new system in operation about the first of the coming year.

Increase in Switching Charge at Versailles, Ind.

The Indiana Public Service Commission recently entered an order allowing the Versailles Telephone Co., of Versailles, Ind., to increase its rate for switching service from $1 to $2 a year, it being shown that this form of service was being given at a loss.

Council Recommends Merger at Beaumont, Texas.

The Beaumont, Texas, city council has passed a resolution recommending that the two telephone companies operating in the city consolidate their systems. The two companies cause an added tax and the service is not thereby improved, the resolution states. The companies operating in Beaumont are the Beaumont Telephone Co. and the Southwestern Telegraph & Telephone Co.

Convention of Wisconsin State Telephone Association.

P. J. Weirich, secretary of the Wisconsin State Telephone Association, has announced that the next annual convention of the Wisconsin association will be held on Wednesday, Thursday and Friday, February 9, 10 and 11, at the Park Hotel, Madison, Wis. The association's three-day convention last year proved a great success and a still better and more successful meeting is looked for this year.

Report on Chicago Automatic Situation Made Public

Kempster B. Miller in His Report on Investigation of the Automatic Telephone Situation in Chicago, Points Out the Two Courses Which City May Take—Report Gives Comprehensive Analysis of All Possible Solutions of Problem

The latter part of last week and early this week the matter of the automatic telephone system in Chicago occupied the attention of the council committee on gas, oil and electric light. The report, which the council committee last July authorized Kempster B. Miller to make on the automatic telephone situation in Chicago, was presented to the committee October 21. Mr. Miller appeared before the council committee on gas, oil and electric light on October 25 and 26 and read and explained in detail his report on the automatic telephone situation. After he had completed the reading of his report, in which he recommends either forfeiture by the city or sale to the Bell company, it was decided by the council committee to request N. C. Kingsbury, vice-president of the American Telephone & Telegraph Co., New York, to come to Chicago to meet the committee.

The report is a comprehensive one, going into the history of the automatic telephone enterprise in Chicago, commercial aspects of the present system, its present usefulness, the reasons for its financial failure and the possible courses which are open to the city. As a result of his analysis of the situation, Mr. Miller states that the problem resolves itself into a choice between two comparatively simple courses:

The Two Courses Open To City.

(a) To take the property for forfeiture and dispose of it for cash. Under present conditions Mr. Miller estimates its cash value, if thus disposed of now, to be from $750,000 to $1,000,000. This course means the certain discontinuance of automatic service, and the object of forfeiture resolves itself into merely the securing of money for the city.

(b) To permit the sale of the property to the American Telephone & Telegraph Co., after making the necessary provisions to prevent undue inflation of the amount upon which the Chicago Telephone Co. will be allowed to earn a fair return. This means the probable discontinuance of automatic service in Chicago.

The choice between these two courses, or any compromise between them, depends on considerations of law and equity and of municipal policy.

Mr. Miller concludes that any attempt to continue the operation of the automatic system as a competing enterprise, either under city or private control, and either with or without interconnection with the system of the Chicago Telephone Co., will not be conducive to better or cheaper telephone service in Chicago. It will tend to lower the possible standard of service, raise the cost of service, and will in all probability cause the loss of large sums of money, failing for lack of public support.

If the city acquires the automatic telephone properties by forfeiture the only sure way to make it a real asset will be to discontinue its operation, dismantle the plant and sell it in whole or in part. By disposing of the property in this way the city could probably realize from $750,000 to $1,000,000 in cash, the amount depending in part upon the final decision of the courts as to what uses the city could make of the telephone conduits and the cable space in the tunnel.

If the city decides that it has not the moral or the legal right to take the property by forfeiture, or if having these rights it deems it unwise from the standpoint of public policy to exercise them, the best course will be to permit the present owners to sell it to the American Telephone & Telegraph Co. While the price agreed upon—$6,300,000—seems unduly large, Mr. Miller does not see that the city is more than indirectly concerned in what the A. T. & T. Co. pays. The city, however, is very directly concerned in what the Chicago Telephone Co. will pay the A. T. & T. Co. for the property, if the price is to affect the telephone rates the public will pay in the future. In this respect the city and the Illinois Public Utilities Commission have ample power to safeguard the interests of the public.

Revenue Only One-Fifth of Total Annual Charges.

In his investigation of the automatic system, Mr. Miller found that there is a present revenue collected of about $150,000 or $180,000 per annum. The operating expenses figure $26,000 per month, or $312,000 per annum. Upon the assumption that there is $6,000,000 invested in the plant—and there is undoubtedly more than that—and that this sum would be required to bear interest at 6 per cent. there would be an interest charge of $360,000 per annum. Upon the assumption that the actual reproduction cost of the plant is $4,500,000 and that depreciation would be provided for at a rate of 4 per cent. on a sinking fund basis, there would be a depreciation charge of $180,000 per annum.

The total annual charges would, therefore, be $852,000, on the basis that operating expenses be kept at the present low mark of approximately $26,000 per month. As the present revenue is only $180,000 per annum, it is seen that a gross income of nearly five times the present amount would be required in order to break even.

Analysis of Need for Continuance of System.

To gain an idea as to whether there is any considerable need or desire for the continuance of the automatic system, an investigation was made of the amount and kinds of traffic now handled and also the extent to which the subscribers of the automatic system find it necessary to be subscribers of the Bell system. It was found that at the present time the calls average about 3.5 per telephone per day, but Mr. Miller believes that the actual useful messages resulting are very much fewer. In the loop district of the Chicago Telephone Co. there are made daily about 8.75 calls per telephone. As to the character of the service an analysis seems to bear out the conclusion that the automatic apparatus is carrying out its functions fairly well, and that most of the abnormalities in the service are due to the character of the company's clientele rather than to improper action of the plant.

In regard to duplication it was found that only 6½ per cent. of the total number of automatic subscribers who are apparently desirable, are not Bell subscribers. It is, therefore, concluded that the automatic system is doing little if anything to extend the field of telephone service in Chicago.

The investigations show that from a financial standpoint the automatic system in Chicago up to the present time has been a flat failure. The fundamental cause for this failure is said to be due to the fact that it was started at a time when the field was fully covered by an aggressive company which had attained a high ratio of telephones to population.

In the matter of rates, it is pointed out that the average rate per station charged by the Chicago Telephone Co. in 1911 was $38.85 per annum, while the average rate per sta-

tion which would have resulted had the automatic service been charged for at its schedule rates during the last part of 1911 was $41.52. Thus for a service limited as to area and numbers, the automatic system was attempting to charge rates which on the average were slightly higher than those of its competitors. A comparison of long distance service of the two companies is also quite unfavorable to the automatic system. Another contributing cause to the failure in Chicago has been the lack of loyal local support.

In reference to the two principal courses open to the city, Mr. Miller states that there are three propositions to be considered in case the city should succeed in taking the property by forfeiture and two propositions should it decide not to take it by forfeiture. In case of forfeiture these are:

1. The city may operate the automatic system in competition with the manual system of the Chicago Telephone Co.

2. The city may turn it over to some grantee or licensee to be operated in competition with the system of the Chicago Telephone Co.

3. The city may dismantle the plant and dispose of its component parts for cash or other considerations.

In case of non-forfeiture the following propositions should be taken into consideration:

1. The city may extend the grant of the Chicago Tunnel Co. or its successors, permitting that company to work out its own salvation.

2. The city may allow the Chicago Tunnel Co. to sell the property to the American Telephone & Telegraph Co. for the agreed price of $6,300,000 for the ultimate use or disposal of the Chicago Telephone Co. If this is permitted it is necessary to consider what benefits to the public could be derived from a continued use of the automatic system, and what provisions or restrictions, if any, shall be imposed on the buyer as to the disposition of the plant in so far as it may affect the capital account of the Chicago Telephone Co. and the rates it will charge for service.

In regard to the first proposition, in case of forfeiture, Mr. Miller strongly advises against an attempt to operate the system as a competing enterprise. It would result in a financial failure and would not otherwise promote the welfare of the public, either by giving better or cheaper telephone service. On the contrary, it would tend to cause a deterioration of the quality and increase the cost of telephone service to the public.

The plan of the second proposition—ownership by the city and operation by a licensee—Mr. Miller states is so fundamentally wrong and the odds against its success so overwhelming that he does not believe any management, no matter how efficient, could avert the ultimate failure.

In regard to the third proposition—that the city dismantle and dispose of the plant—Mr. Miller concludes that there would result a definite asset in the form of from $750,000 to $1,000,000 in cash, which estimate is based on the present condition of the equipment and present market prices.

In regard to the proposition of continued operation of the telephone company in case of non-forfeiture, the record of the present system and the system preceding it, Mr. Miller points out, shows nothing but financial loss, and, therefore, leaves no hope for better things. He does not believe that the present company nor any successor would be sufficiently benefited by any plant of interconnection with the Chicago Telephone Co. to perceptibly alter the chances for success.

In regard to the last proposition—that of permitting the sale to the American Telephone & Telegraph Co., for $6,300,000—Mr. Miller has not been able to convince himself that the Chicago Telephone Co. could, if it acquired the plant, continue to operate it with profit to itself. He concludes, therefore, that the city should squarely face the fact that if it does permit the sale, the discontinuance of automatic service and the dismantling of the automatic plant will probably follow.

In lieu of forfeiture it was urged in an informal discussion following the reading of the report, that the company be required to pay into the city treasury a certain sum as a penalty for its failure to maintain a system serving 20,000 bona fide subscribers. Upon the payment of this sum, according to the scheme, the company would be permitted under certain restrictions to sell out to the American Telephone & Telegraph Co.

The proposal contemplates assessing the automatic company $500,000. This amount has been worked out on the basis of the original automatic franchise ordinance, which provided for a penalty of $50,000 in case the company failed to obtain 2,000 subscribers within the time specified. The present ordinance has a requirement for 20,000 subscribers, and the proposed $500,000 assessment is arrived at by multiplying the original figure by ten.

The principal argument that is being advanced in favor of this proposal is that the city treasury probably would benefit more by this method than if forfeiture proceedings were started.

Even the aldermen who are in favor of the sale, however, insist that the capitalization of the Chicago Telephone Co. must not be inflated beyond the actual value of the property taken over. Ralph M. Shaw, attorney for the bondholders of the automatic company, has informed the aldermen he has obtained an agreement with the American Telephone & Telegraph Co. which will protect the city on this point.

Program for Operators' Meeting, at Paris, Ky.

An interesting program was arranged by the Central Home Telephone & Telegraph Co., for the operators' meeting scheduled to be held at Paris, Ky., October 30. According to the plans the afternoon session was to be devoted to a chief operators' conference, sight seeing and getting acquainted. In the evening a banquet was to be served at Hotel Windsor. The program is as follows:

"Our first operators' meeting," by Mrs. Williams, Cynthiana. "How I have found the best way to increase toll business," by Mrs. E. Burgin, Paris. "Why I think I was promoted to the position as chief operator," by Miss Tessie Slade, Cynthiana. "How operating affects 100 per cent. collections," by Miss Lillie Martin, Carlisle. "Some of the errors I find in posting toll tickets," by Miss Anna Dodson, Maysville. "My idea of eliminating errors on toll tickets," by Miss Maude Day, Paris. "Handling service complaints," by Miss Murphey, Maysville. "How it feels to be really interested in our work," by Miss Rosa Collins, Carlisle. "The best way for a chief operator to win the confidence and loyal support of her operators," by Miss Jessee Wilmot, Frankfort. "Service," by Miss Ona Hyatt, Lawrenceburg. "Codes, and their use," by Miss Lutie Banta, Carrollton. "Long distance operating methods," by Miss Harrison, Louisville. "Some of the troubles I have noticed in our operating," by Minor Corman, Louisville. "General operating," B. Y. Chambers, Louisville. General discussion.

New Tri-State Telephone Co., of Nebraska.

Merger of various telephone interests of northwest Nebraska into a $250,000 corporation will follow filing of the articles of incorporation of the Tri-State Telephone Co. with Secretary of State Pool on October 4. The territory embraced in the new company's operations is from Valentine on the east to Lusk, Wyo., on the west, and from Alliance on the south to Ardmore, S. D., on the north. Those interested in the company are Evan B. Warner, of Chadron; E. M. F. Leflang, of Omaha, and A. E. Grantham of Lexington.

The Study of Transmission Problems by Means of Vectors

Uses and Limitations of the Mathematical Treatment—Factors Determining Quality of Speech Transmission —Graphical Determination of Line Characteristics and Development of Formulae for Attenuation and Wave Length—Reflections—Final Installment

By E. W. Kellogg

We have found the change in phase and in current strength per mile for a particular case by the graphical method. It is a simple matter by analyzing the graphical construction, to develop a general formula which may be applied to any line.

We shall again assume that the terminal apparatus is far enough away for the relations between voltage and current to have become constant, and shall choose a reference point from which to measure the distance l, and figure the current at any other point in terms of the current I_0 at the reference point. The leakage will be considered negligible. The following symbols will be used:

L=the inductance of the circuit in henrys per mile.
R=the resistance of the circuit in ohms per mile.
C=the mutual capacity of the line conductors in farads per mile.
$\omega=2\pi f$, in which f is the frequency in cycles per second.
Δl stands for a short section of line (measured in miles).
I=the current l miles from the zero point.
I'=the current $l+\Delta l$ miles from the zero point.
ΔI=the charging current for the section $\Delta l=E\omega c\Delta l$.
I' is the vector sum of I and ΔI.
E and E' have the corresponding significance in regard to the voltage.
$\Delta E=I\times\sqrt{R^2+\omega^2L^2}\Delta l$.

Fig. 4 shows the relation between the current and voltage vectors.

The triangle O-I-I' is similar to the triangle O-E-E', since both vectors advance by the same angle in Δl miles, making the angle between I and I' the same as the angle between E and E', and since both vectors increase in the same ratio in Δl miles, so that $I':I=E':E$. Since the triangles are similar $\Delta I:I$ as $\Delta E:E$ or $\dfrac{E\times\omega C\Delta l}{I}=\dfrac{I\times\sqrt{R^2+\omega^2L^2}\Delta l}{E}$

$$\frac{E^2}{I^2}=\frac{\sqrt{R^2+\omega L^2}\Delta l}{\omega C\Delta l} \qquad \frac{E}{I}=\sqrt{\frac{\sqrt{R^2+\omega^2L^2}}{\omega C}}$$

This is the impedance of the line whose receiving apparatus is so far away that its effect is lost, or what is called the impedance of an infinite line, or sometimes simply the "line impedance." We shall designate this quantity by Z_l.

We can next find the impedance angle which we shall call θ, or the angle between the voltage and the current.

ΔI is 90° ahead of E.

ΔE is ahead of I by the angle $\tan^{-1}\dfrac{\omega L}{R}$ (See Fig. 4).

Since I is ahead of E by the angle θ, ΔI is ahead of I by 90°—θ°, and ΔE is ahead of E by $\theta+\tan^{-1}\dfrac{\omega L}{R}$.

From the similarity of the two triangles, these two angles are the same, whence $\theta+\tan^{-1}\dfrac{\omega L}{R}=90°-\theta$

$$\text{or } \theta=\frac{1}{2}(90°-\tan^{-1}\frac{\omega L}{R})=\frac{1}{2}\tan^{-1}\frac{R}{\omega L}.$$

In a line of negligible inductance, such as cable, θ=45°.

If the inductance is made high so that ωL is large compared with R, θ is reduced to a much smaller value. In a line loaded with inductance coils, θ may be reduced to an angle as small as 2° or even less. This has the effect of improving the efficiency of the line for, as will be seen by reference to Fig. 5, if θ is small, ΔI is nearly at right angles to I, and the effect is to rotate the vector more rapidly, but not to increase it so fast. The effect of increasing the inductance is thus to shorten the wave length, and to make the waves waste less rapidly in transmission.

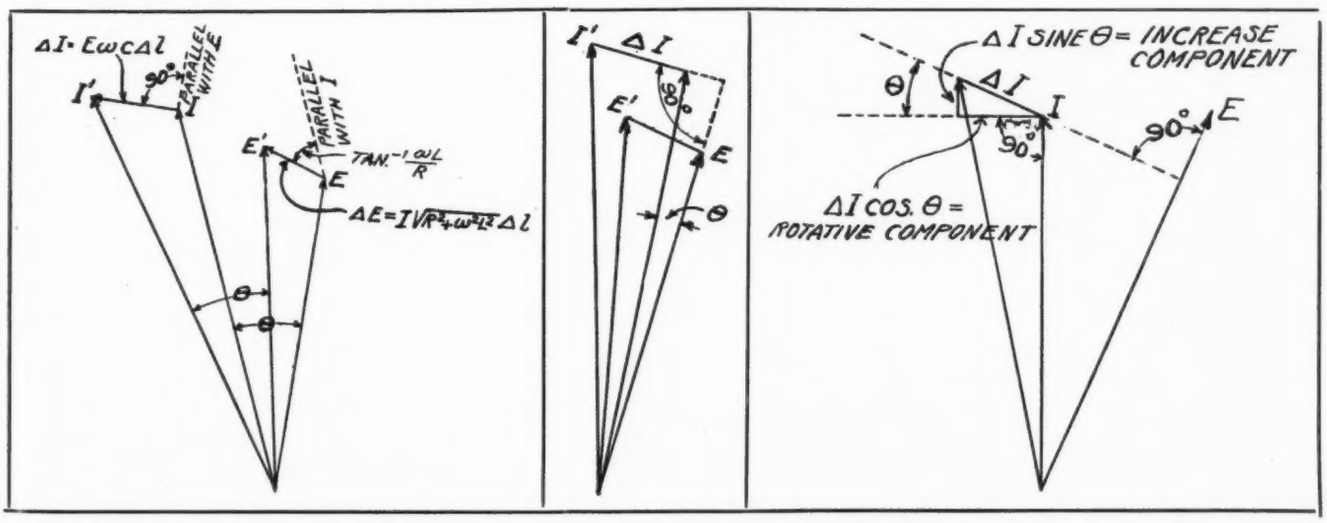

Fig. 4. Relation Between Current and Voltage.—Fig. 5. Effect of High Power Factor on Rate of Increase.—Fig. 6. Increase and Rotative Components of Line Charging Current.

The thoughtful reader will perhaps ask the question at this point: "How is this possible? Adding inductance to the line has not made the resistance any lower, and how can the same current be transmitted with any lower loss than formerly?"

The answer to this question is that the same current is not

transmitted with any lower loss. The loss for the same current is actually very slightly increased. But the same current carries more energy in a line of high inductance, and therefore the percentage of energy lost in each mile is less. The energy transmitted by a given current is greater because the voltage is higher and the power factor higher. It will be remembered that adding inductance brings the voltage and current more nearly into phase, and since adding inductance increases the line impedance, a higher potential would have to be impressed, in order to get the same current.

The matter may be looked at from a slightly different point of view. Consider the traveling wave as a moving charge on the wires. A moving charge means a current. The faster the charge moves, the higher the current. As the rate of dissipation of energy varies with the square of the current, more energy is wasted by moving the charge rapidly than by moving it slowly. It was seen that loading shortens the wave length, or slows down the rate of propagation. Since the charges are transferred more slowly over the loaded line, the energy in them is better conserved.

Having found the value of the line impedance, Z_l and the angle θ between the voltage and current, we may work out an expression for the change in phase per mile and the change in magnitude per mile.

ΔI may be resolved into two components (See Fig. 6): (1) a component parallel to I which affects the magnitude of I but not the direction; and (2) a component perpendicular to I, which produces change in direction but negligible change in magnitude.

The parallel component is $\Delta I \sin\theta$, and the perpendicular component is $\Delta I \cos\theta$.

Since $\Delta I = \omega C E \Delta l$, and $E = IZ_l$, $\Delta I = IZ_l\, \omega C \Delta l$.

$\frac{\Delta I \cos\theta}{I}$ is the angle (expressed in radians) through which the vector turns in Δl miles, or the rate of turning in radians per mile is

$$\frac{\Delta I \cos\theta}{I\Delta l} = \frac{IZ_l \omega C \Delta l \cos\theta}{I\Delta l} = \omega C Z_l \cos\theta = \omega C \sqrt{\frac{\sqrt{R^2+\omega^2L^2}}{\omega C}} \cos\theta$$

$$= \sqrt{\omega C \sqrt{R^2+\omega^2L^2}} \cos\theta.$$

This quantity, the change in phase per mile (in radians) is designated by β.

The increase in current strength in Δl miles is $\Delta I \sin\theta$, and the rate of increase is $\frac{\Delta I \sin\theta}{\Delta l} = \frac{IZ_l \omega C \Delta l \sin\theta}{\Delta l} = IZ_l \omega C \sin\theta$.

The mathematical way of expressing the rate of increase is $\frac{dI}{dl}$ so that we have $\frac{dI}{dl} = IZ_l \omega C \sin\theta$, or by substituting $\sqrt{\frac{\sqrt{R^2+\omega^2L^2}}{\omega C}}$ for Z_l,

$$\frac{dI}{dl} = I \sqrt{\omega C \sqrt{R^2+\omega^2L^2}} \sin\theta.$$

We found that the variation of current strength with distance might be expressed by an equation of the form $I = I_o \epsilon^{\alpha l}$. Differentiating this general equation gives $\frac{dI}{dl} = \alpha I_o \epsilon^{\alpha l} = \alpha I$. Equating the two values of $\frac{dI}{dl}$ gives $\alpha = \sqrt{\omega C \sqrt{R^2+\omega^2L^2}} \sin\theta$.

While this form of the equation for α is as convenient as any for working out the value, it is often given in a different form which we may derive by making a substitution for $\sin\theta$.

$\sin\theta = \sqrt{\frac{1-\cos 2\theta}{2}}$. Since $\theta = \frac{1}{2}\tan^{-1}\frac{R}{\omega L}$, $\tan 2\theta = \frac{R}{\omega L}$

from which $\cos 2\theta = \frac{\omega L}{\sqrt{R^2+\omega^2L^2}}$ (see Fig. 7 in which the angle at the left is 2θ).

$$\sin\theta = \sqrt{\frac{1}{2}\left(1 - \frac{\omega L}{\sqrt{R^2+\omega^2L^2}}\right)} = \sqrt{\frac{1}{2}\,\frac{\sqrt{R^2+\omega^2L^2}-\omega L}{\sqrt{R^2+\omega^2L^2}}}$$

$$\alpha = \sqrt{\omega C \sqrt{R^2+\omega^2L^2}} \times \sqrt{\frac{1}{2}\,\frac{\sqrt{R^2+\omega^2L^2}-\omega L}{\sqrt{R^2+\omega^2L^2}}}$$

$$= \sqrt{\frac{\omega C}{2}(\sqrt{R^2+\omega^2L^2}-\omega L)}$$

By substituting $\sqrt{\frac{1+\cos 2\theta}{2}}$ for $\cos\theta$ in the expression for β, we obtain

$$\beta = \sqrt{\frac{\omega C}{2}(\sqrt{R^2+\omega^2L^2}+\omega L)}$$

The "attenuation constant" α, which is the natural logarithm of the change in current strength per mile (expressed as a ratio), is very nearly equal to the per cent. reduction in current per mile. The distance to which conversation can be carried on over a circuit of any kind is inversely proportional to α.

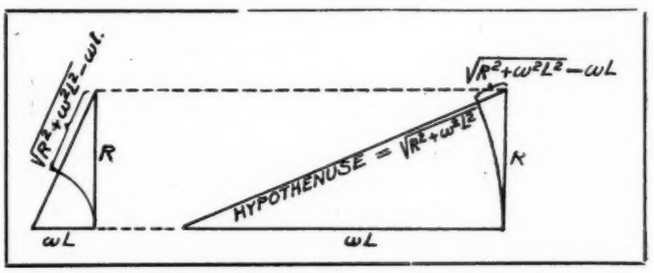

Fig. 7. Diagram Showing How Increasing Inductance Reduces Attenuation Constant.

The smaller α can be made then, the more efficient the line. From the formula it is seen that α varies as the square root of the line capacity, which in part accounts for the inferiority of the transmission over cables as compared with open wire lines. The manner in which α depends on ω, R and L, is somewhat more complex, but may be seen in a general way from the following:

If the inductance is negligible $\alpha = \sqrt{\frac{\omega C R}{2}}$, in which case α varies as the square root of R. Since ω enters into the expression in the same way, the attenuation is much greater at high frequencies than at low frequencies, and therefore there is a large amount of distortion.

Adding inductance to the circuit effects a reduction in the value of α, for, as shown in Fig. 7, increasing ωL makes the quantity $\sqrt{R^2+\omega^2L^2}-\omega L$ smaller. Increasing ω has the same effect, but since ω enters as a multiplying factor, the reduction in $\sqrt{R^2+\omega^2L^2}-\omega L$ is offset. Fig. 8 shows the reduction in α resulting from the addition of various amounts of inductance, to a No. 19 gauge, .07 mf. cable, the frequency being taken as 800 periods per second.

If there is sufficient inductance so that ωL considerably exceeds R, the formula $\alpha = \sqrt{\omega C \sqrt{R^2+\omega^2L^2}} \sin\theta$ may be simplified as follows:

$\sqrt{R^2+\omega^2L^2}$ becomes approximately equal to ωL, and $\sin\theta$ is very nearly equal to $\frac{R}{2\omega L}$ (for when θ is small $\frac{1}{2}\tan 2\theta$ which is $\frac{R}{2\omega L}$, is approximately equal to $\tan\theta$ which differs very little from $\sin\theta$). This makes α equal to $\sqrt{\omega C \times \omega L} \times \frac{R}{2\omega L} = \frac{R}{2}\sqrt{\frac{C}{L}}$

As ω is eliminated from this expression, the line transmits different frequencies with the same rate of attenuation, or there is no distortion. In the practice of loading, the coils are de-

signed to insert sufficient inductance to make ωL considerably greater than R except for the very lowest frequencies.

REFLECTIONS.

It will be recalled that we had to travel some distance from the receiving station before the relation between voltage and current became constant and before we could make the assumptions necessary to the working out of the relations just shown. In other words, near the terminal the conditions of a simple traveling train of waves apparently did not apply. What is the condition near the terminal?

If we watch a water wave traveling along a trough, we notice that upon reaching the end it reverses and travels in the other direction. In other words, it is reflected. Exactly the same thing happens when an electric wave reaches the end of the line. If the end is open circuited, the entire wave is reflected back. If it is not open circuited, but terminates in apparatus having some impedance, a part of the wave passes through the terminal apparatus, and the remainder is reflected.

If the terminal apparatus is of the same impedance as the line, there is no reflection, for the terminal apparatus receives the wave exactly as would an additional stretch of the same kind of line. Had we begun with a receiving station of the same impedance and power factor as the line in Fig. 3, we should have found that the voltage and current maintained a constant relation from the start.

It appears then that the abnormal conditions near the terminal are due to the presence of a reflected wave. As we go out on the line away from the receiving station, we are traveling with the reflected wave, and therefore find it getting feebler as we go. Finally it is small enough to neglect, and we have the steady conditions due to the oncoming wave alone.

The working out of the currents and voltages step by step as was done in Fig. 3 is a laborious process and must be done with much care or considerable error will result. The process of rotating a vector by a certain angle, and changing its length in a certain ratio on the other hand, is a comparatively simple one. Suppose the voltage and current at the receiving station are known and it is desired to find them at a point l miles away.

If we could split up the current into two parts, one due to the oncoming and the other due to the reflected wave, and draw the vector corresponding to each, we could trace the changes in the two separately by the simple process of multiplication and rotation, and then, by recombining them, find the current at any point desired. Each mile measured toward the source sees the vector of the oncoming wave increased in length in the ratio ϵ^{α}:1, and advanced in phase by an angle β,

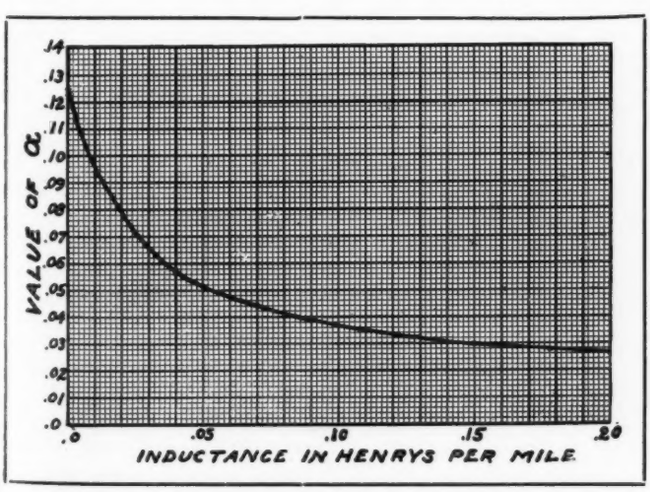

Fig. 8. Effect of Adding Inductance to No. 19 Gauge Cable.

while each mile sees the vector of the reflected wave retarded in phase by β, and reduced in length in the ratio 1:ϵ^{α} or $\epsilon^{-\alpha}$:1.

The separation of the receiving station current into the two components is a simple matter to perform. The method will be given here but its general proof requires the use of a mathematical tool (known as "the symbolic method," or as "Steinmetz's notation") which we wished to avoid introducing here. We shall content ourselves with working out an expression for a simple case, and then seeing whether the same method can be applied to the more general case.

The simplest case of a reflection is one where the line is such that the current and voltage are practically in phase (as is

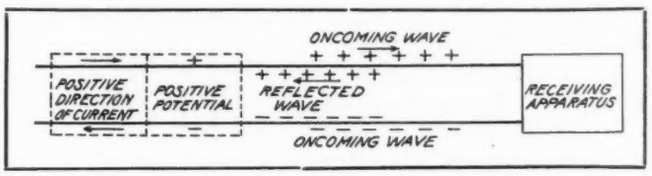

Fig. 9. Voltage and Current Relations of Oppositely Moving Waves.

true of loaded lines) and where the receiving station is also a unity power-factor impedance.

Let Z_t = the impedance of the receiving apparatus.

I_t = the total current due to both waves, or the current through the terminal apparatus.

E_t = the total difference of potential between the two sides of the line due to the two waves, or the potential across the terminals of the receiving apparatus.

$$E_t = I_t Z_t$$

Let I_a = and E_a represent the current and voltage due to the oncoming wave.

I_b and E_b, the current and voltage due to the reflected wave.

In all vector problems, it is necessary to define clearly what current directions, and what polarities are to be taken as positive. Fig. 9 shows this for the problem in hand. It will be seen that when the charges, and consequently the potentials, of the oncoming and returning waves are of the same polarity and add, the currents are opposite and subtract.

With the oncoming wave, the current is positive when the voltage is positive, and we may write $E_a = I_a Z_l$, while in the case of the reflected wave the current is negative when the potential is positive (a positive charge moving to the left on the upper wire constitutes a negative current). Therefore the relation between voltage and current for the returning wave is given by $E_b = -I_b Z_l$.

Since the combination of the two waves gives a current equal to that through the terminal apparatus, and a potential equal to that impressed across the terminal station, $I_t = I_a + I_b$

and $E_t = E_a + E_b$ or $I_t Z_t = I_a Z_l - I_b Z_l$ or $I_t \frac{Z_t}{Z_l} = I_a - I_b$

Adding, $I_t = I_a + I_b$

and $I_t \frac{Z_t}{Z_l} = I_a - I_b$

gives $I_t(1 + \frac{Z_t}{Z_l}) = 2I_a$ or $I_a = \frac{I_t}{2}(1 + \frac{Z_t}{Z_l})$.

Subtracting,

$$I_t(1 - \frac{Z_t}{Z_l}) = 2I_b \text{ or } I_b = \frac{I_t}{2}(1 - \frac{Z_t}{Z_l}).$$

The expression for I_b is negative if Z_t is greater than Z_l. That is to say, the currents of the two waves subtract if the terminal impedance is higher than that of the line. At the same time the voltages add. Hence a high impedance terminal is supplied with small current at high potential.

On the other hand if the terminal station has a lower impedance than the line, I_b is positive and adds to I_a, supplying the terminal with greater current than the oncoming wave alone would furnish. But the voltages in this case subtract, so that the potential is low. In either case there is a loss of energy, for the reflected wave carries back a certain amount of energy, only to waste it in traveling back toward the sending end.

In order to reduce this loss to a minimum, the terminal apparatus should have an impedance as nearly equal the line im-

pedance as possible, for this makes the reflected wave small. All abrupt changes in impedance are a source of loss through reflection, whether those changes in impedance are at the terminals of the line, or due to apparatus inserted at switchboard connections, or at junctions of lines of different types having different impedances.

The energy carried by a wave varies with the square of the current, the energy being proportional to the product of the current and voltage and the voltage being directly proportional to the current. Hence, in order to estimate the energy lost in any reflection, it is only necessary to compare I^2_b with I^2_a, the percentage of energy lost being $\left(\frac{I_a}{I_b}\right)^2 \times 100$. This proposition holds only where the entire energy in the reflected wave is lost.

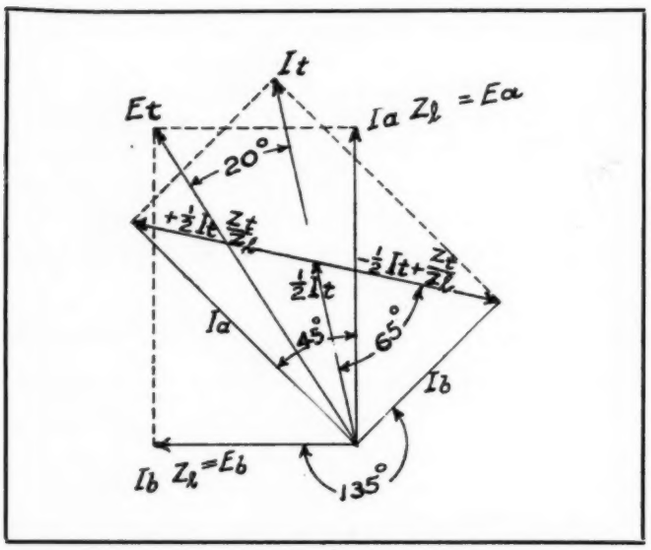

Fig. 10. Separation of Total Current Into Oncoming and Reflected Waves.

If the reflected wave quickly strikes a second change in impedance which throws it forward again, it will reinforce the oncoming wave, and only a small part of its energy will be lost. This explains the success of loading with concentrated inductances. Each coil is a point of reflection, but the coils are placed so close together that the reflected wave hardly starts back before it strikes the preceding coil and is thrown forward again before it has traveled far enough to have spent much of its energy.

To make a general application of the method just worked out for separating the total current into the parts due to the two waves, it is necessary to take phase differences into account. We shall use the expression in the same form, but shall attach to the terms Z_t and Z_l, a significance in regard to phase as well as numerical value. We may write the expression for I_a in the form $\frac{1}{2}I_t + \frac{1}{2}I_t\frac{Z_t}{Z_l}$. Both the terms in this expression stand for currents, and I_a is their vector sum (See Fig. 10).

The current represented by the second term may be thought of as the current which would flow into a line of Z_l ohms impedance, with an impressed voltage of $\frac{E_t}{2}$, for $\frac{I_t Z_t}{2} = \frac{E_t}{2}$. But this current would lead $\frac{E_t}{2}$ by the line impedance angle θ_l, and $\frac{1}{2}E_t$ would differ in phase from $\frac{1}{2}I_t$ by the angle θ_t or the terminal impedance phase angle.

If the terminal and the line phase angles are known, $\frac{1}{2}I_t\frac{Z_t}{Z_l}$

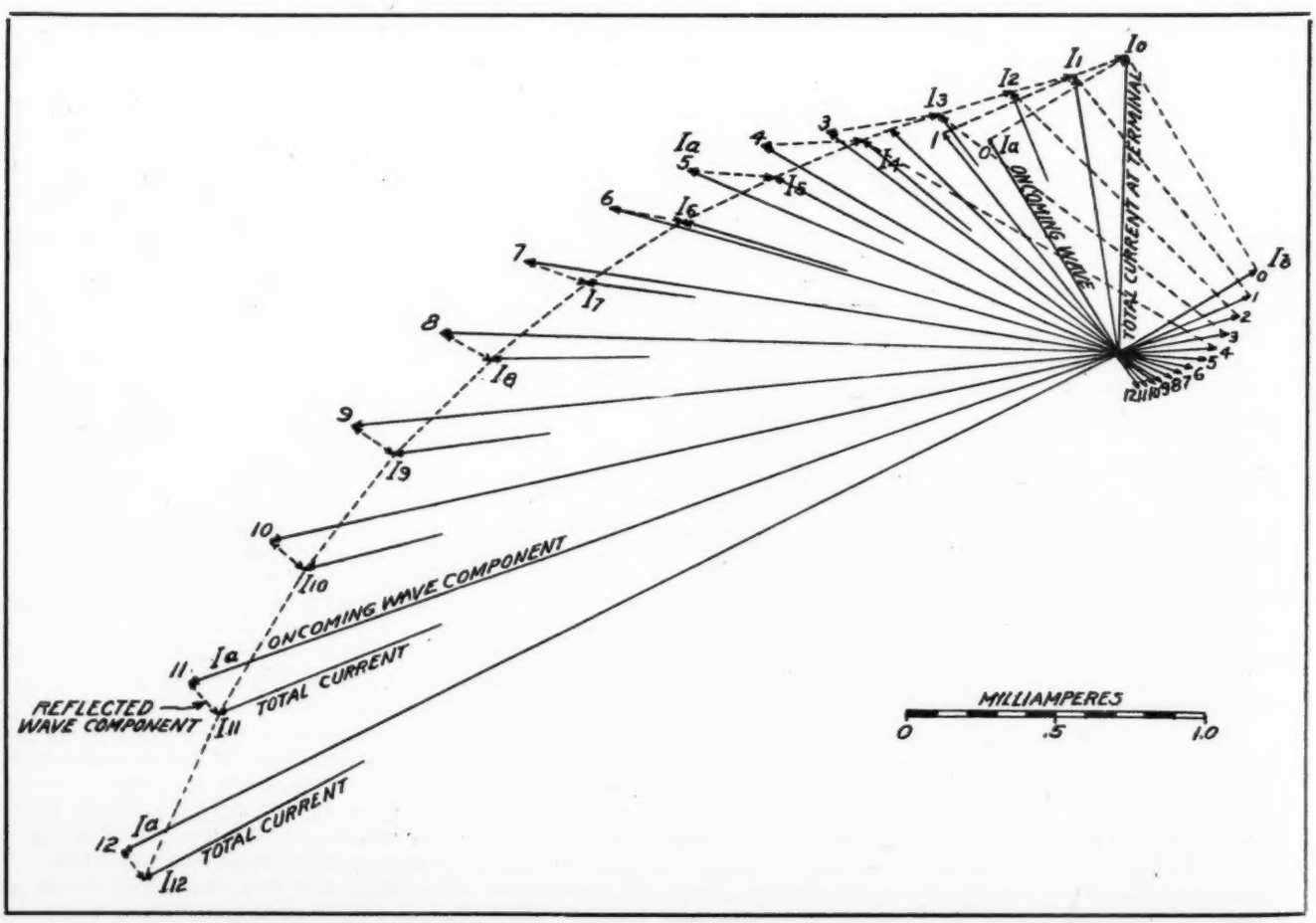

Fig. 11. Vectors of Current at Various Distances from the Receiving Station.

can be laid off in the proper direction with relation to $\frac{1}{2}I_t$. If a phase angle is defined as positive when the voltage is ahead of the current and negative when the voltage lags. Then $\frac{1}{2}I_t\frac{Z_t}{Z_l}$ will be ahead of $\frac{1}{2}I_t$ by the angle $\theta_t-\theta_l$ (the algebraic signs of the angles being taken into account). To find I_b it is only necessary to reverse the vector of $\frac{1}{2}I_t\frac{Z_t}{Z_l}$ and add it to the vector of $\frac{1}{2}I_t$.

The voltage vector E_a will be behind I_a by θ_l, since the line impedance always has a negative phase angle. Its numerical value is I_aZ_l. The vector E_b will be behind I_b by $180°+\theta_l$ for the current of a returning wave is reversed as compared with what it would be for a forward moving wave.

As a check on the work so far, the vector sum of I_a and I_b should be I_t, and the vector sum of E_a and E_b should give E_t.

Having found the four vectors I_a, I_b, E_a and E_b, we can find the current and voltage l miles away by rotating E_a and I_a βl radians or $\beta l\times 57.3°$ counter clockwise, and multiplying them by $\epsilon^{al}=10^{.4343al}$ and by rotating E_b and I_b $\beta l\times 57.3°$ clockwise and dividing them by $10^{.4343al}$.

Let us apply this method to the same problem that was assuming a milliampere through the receiving station; find the voltage and current at the cord circuit end of the first line; see what changes in voltage and current are introduced by the cord circuit (as by series impedance or by leakage through retardation coils or repeating coils); and starting with the voltage and current so found trace the changes occurring in the second line.

It might then appear that in order to get a milliampere through the receiving station, the sending station would have to supply seven milliamperes at four volts. If the sending station were capable of supplying only three milliamperes when working against this much impedance, then the receiving station current would be reduced in the same proportion.

The effect of any proposed change in apparatus or circuits on the transmission efficiency of the entire connection may be determined in this manner.

Texas Company Shows Consideration for Women Employes.

The Texas Telephone Co., of Waco, Texas, is receiving commendation from the press because of the consideration that company has shown for its women employes in the arrangements and planning of the new telephone building in Waco. The new building, as shown by the plans, contains many features of great benefit and convenience to the company operators and other women employes, a roof garden for the use of the operators having attracted considerable attention.

Said one Waco paper editorially: "The Morning News congratulates the Texas Telephone Co. on the consideration it has

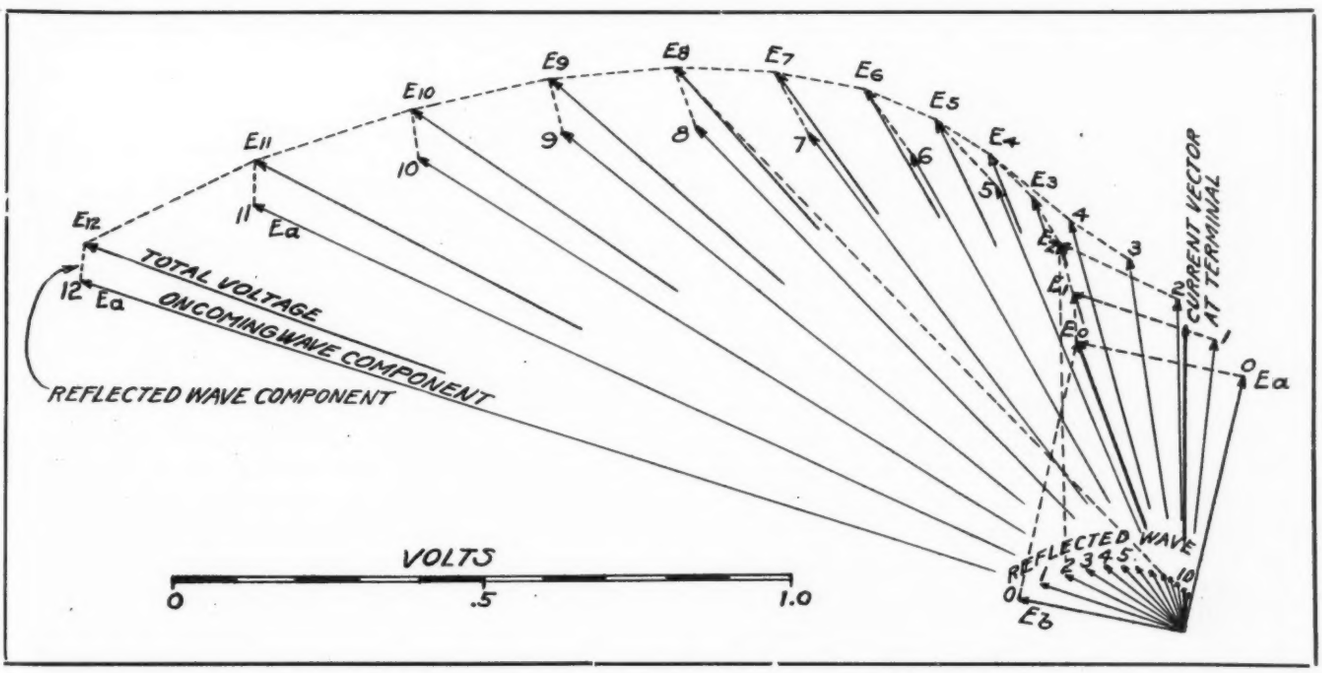

Fig. 12. Vectors of Voltage at Various Distances from Receiving Station.

worked out in Fig. 3. In this case, as before, I_t=.001 ampere, Z_t=500 ohms, and E_t=500×.001=0.5 volts leading I_t by 20°. θ_t=20° in this problem and θ_l=—45°, so that $\theta_t-\theta_l$=+65°. Fig. 10 shows the construction by which the vectors I_a, I_b, E_a and E_b are found. In Figs. 11 and 12, the changes in current and voltage along the line are worked out. In order to afford a better comparison with the results of Fig. 3, the voltage and current are shown for each mile, and it is seen that the results by the two methods agree.

By the method given the characteristics of any circuit, whether simple or built up of a series of different lines, can be worked out for any given frequency, provided the characteristics of any apparatus that may be introduced are known. For example, if it is desired to figure the transmission over two lines connected through a cord circuit, we should begin by

shown for the comfort and welfare of its employes in planning its new building. . . . The company has aligned itself with progressive corporations that realize they owe a duty to their employes and the public no less important than the duty they owe to their stockholders. . . . It is especially gratifying to know that telephone companies, which employ such large numbers of women and girls, are taking the lead in providing wholesome and agreeable surroundings for their employes, and it is especially pleasing to know that our home company is to be a leader in this splendid work."

Excavating for the new telephone building is about completed, and construction work is to begin at once. The building will contain three stories and basement, and will cost about $80,000. Upon its completion the Texas Telephone Co. is to take over the exchange of the Southwestern Bell in Waco.

Fundamental Principles of the Telephone Business

A Reading Course Designed to Present Logically the Principles Which Underlie Successful Organization and Operation of Telephone Properties—Prepared Under the General Supervision of Stanley R. Edwards—Part I, Telephone Economics, by James H. Shoemaker, Completed June 26, 1915—Part II, The Corporate Telephone Organization, by J. C. Kelsey and S. R. Edwards, Completed September 25 Part III, Telephone Accounting and Auditing, Written by James H. Shoemaker

Quiz Questions on the Preceding Installment.

23. Draw up examples of opening entries with the stock sold above par. When sold below par.

24. How would entries be made when stock is issued for property?

25. What is the purpose of the "Subsidiary stock subscribers' ledger"? How would entries be made for cash, installments on stock? Draw up a closing entry after all stock installments have been paid.

26. What credits are necessary when money is received on stock subscriptions?

CHAPTER III. The Groups of Accounts.

27. *The Need for Separate Telephone Accounts.*—Whenever an attempt is made to obtain a record of the comparative efficiency of the various individuals or groups, and to get a comparison of the relative values or advantages of the various methods of a company, it is found that a much larger number of accounts must be kept. For instance, there was a time when many wanted to know whether the use of automobiles for the repairing of toll line troubles was an economy or an extravagance.

There was only one answer that was really worth while. That was the answer which came from a year's trial of the two methods side by side. But it was found that this kind of a trial was almost wholly valueless unless the exact costs, in dollars and cents, were kept of each method separately. And, that meant that a separate account must be opened for every penny paid out for the automobile, and a corresponding account kept, separately, for every penny paid out for the one single team which was used in competition with the automobile.

Now, the natural and almost universal experience was, at that time, to say:

"We will get the figures on these costs separately, but we will not go into any great scheme of bookkeeping. We will just go through the books once a month and take out every item that has been paid out for the automobile. We will add them all up on one sheet of paper, and then go through the books again doing the same for every payment made on account of the team.

But it was found that this meant a lot of work, all in a heap, at the end of the month. It was found that as the demand for operating more cheaply increased, an ever-increasing number of things had to be watched separately—watched *closely*, also—and that there was a constant growth in the number of things which had to be culled out, like the automobile costs and the team costs, from the long list of the month's miscellaneous expenditures.

28. *What Experience Showed Regarding Keeping Separate Accounts.*—In the course of time this supposedly easier method brought to light these two facts:

First. It was a waste of time to "take off" these figures only to throw them away. In other words, when they were being "figured up," the figures might just as well be put on a page of a loose leaf or bound book, and "kept as a record" for future reference or use.

Second. Unless these figures are made a part of the trial balance—unless they are treated as an account as well as a mere record—there is the certainty that they will contain more or less important errors, for every human being will make mistakes in bookkeeping.

In short, it was found, by actual experience, that it took no more time to make these figures up as an account, and show them as a necessary item in some portion of the trial balance scheme of accounts, than to "just run through at the end of the month and figure up the cost." This is on the supposition, of course, that the results thus "figured up" were to be accurate enough to lead rather than to mislead everyone who accepted them as a guide.

29. *Reasons for Grouping of Telephone Accounts.*—Naturally enough this necessity for getting *reliable* records, by the method of treating each such separate group of expenditures as a separate account, *greatly increased the number* of separate accounts. If a balance sheet were to be offered to the average director or shareholder made up in such a way as to include the debit and credit balances of every such separate record, it would seem almost like offering him the entire group of books of the office. So much time would be required in studying out the more general and more important items that the long trial balance would prove practically valueless.

Are not the reasons obvious, therefore, for the grouping of these minor records or accounts as the hair roots of trees group into tap roots—as we have already illustrated—then into trunk roots and finally into one single trunk (the balance sheet total)? Are not the reasons obvious, also, for the subdividing of the outgoing expenditures first from the balance sheet total into the ten or twelve most important items or main trunks of the tree, then into the smaller limbs and finally into the twigs?

30. *Method of Grouping of Telephone Accounts.*—The number of the separate groups of accounts, as prescribed by the Interstate Commerce Commission and as previously followed

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more or less uniformly by the larger companies, is five, as follows:

I. Balance sheet accounts.
II. Plant and equipment accounts.
III. Income accounts.
IV. Operating revenue accounts.
V. Operating expense accounts.

31. *A Purpose of the Balance Sheet Group.*—In presenting the illustration—Fig. 1, The Balance Sheet Tree—in a preceding installment, and in what has just been stated we have, perhaps, said all that is necessary concerning the balance sheet group. One of the main purposes of this particular group is, of course, to show in as condensed and as effectual a manner as possible, the financial condition of the company. It is, in a sense, a "financial statement."

There is, however, this one point which it is well to get firmly fixed in the mind: A corporation always owes, to somebody, every penny's worth of property that it owns.

32. *Banks and Telephone Companies Operate on Borrowed Money.*—A successful manager of one of the larger Independent companies was forced to borrow a considerable amount of credit at a time when he already had a heavy loan at the bank. He knew that the banker would lecture him, more or less, on the dangers of borrowing so heavily. He said to himself: "I might just as well think out in advance what I am going to say in reply."

This was the method of his procedure: As soon as the bank official made his first stop for breath, the telephone manager began:

"Do *you* undertake to lecture *me* about *borrowing?* I think you have overlooked one or two points. What is the amount of your capital and surplus?"

"Our capital and surplus is $240,000," replied the cashier. "But why do you ask me such a question as that?"

"Because," said the manager, "I am going to apply to your own business the principles of the lecture which you have just started to give me. What is the amount of your deposits?"

With pride the official passed to the manager a printed copy of the bank's last statement, on which, in extra large type, was printed: "Deposits $495,173.21." As he gave out this piece of paper the cashier said: "Our deposits are larger than they have ever been before."

"And you are very proud of the fact that you are borrowing more money at this minute than ever before, are you not?" questioned the telephone manager.

Excited and indignant the cashier exclaimed: "What do you mean?"

"I mean this," replied the telephone manager: "Every cent of your deposits is borrowed money; and you, yourself, are owing (to your depositors) more than double as much as your combined capital and surplus. But, without realizing that fact about your own affairs, you start in to read me a lecture, when all I want is an increase of a loan from $15,000 to $20,000. At the very moment when your own institution is advertising the fact that it is borrowing more than double as much as its own property is worth, you try to make me believe that my company is in danger if it tries to borrow one-fifth as much as its property is worth (which happens to be in the neighborhood of $100,000 in actual plant value)."

33. *Why Telephone Enterprises Are Deserving of Loans on Credit.*—"Now, let me tell you something," continued the manager, "I know that my undertaking is just as safe a place for the use of credit or money as yours. I know that my business earns a better return for the use of credit or money than can be earned by your business. If that were not so, how could we pay the amount of interest which you charge? We must earn enough to use other people's money, received through you; and we must pay interest enough to make up both your profits and expenses, over and above all that you pay for the hire of that same money, when you borrow it. If we make our business pay all your expenses and all your profits, why should it be dangerous for us to borrow up to one-fifth of our property value, and safe for you to borrow up to more than double your property value? I refuse to grant your assumption, which is, that you should have a handicap in your favor amounting to ten to one against me."

34. *Relation of Credit to Accounting.*—Perhaps some one is saying: "This has nothing whatever to do with accounting and auditing." If so, he is more than half right. But when a neighboring manager related his actual experience in substantially the manner just set forth, it was not the shrewdness of his method of borrowing that gripped the author the hardest. On the contrary, it was its value as a concrete evidence of these two points:

First. In every business there is a liability for every asset; a debit for every credit. Every penny is borrowed money. While my friend was relating his conversation with his banker, I was thinking: "Yes, and every penny of that bank's capital and surplus is borrowed from its shareholders, just as every penny of your plant's value is borrowed from his shareholders."

Second. As the cashier was prone to forget that his "deposits" were every cent borrowed money, so it is hard for managers to keep up the right habit of thought—hard to keep always awake to the fact that every penny invested in their plants is a borrowed penny.

This experience of my friend, the manager, with his banker helped me to a better appreciation of the grouping of the eleven asset accounts and the eight liability accounts into a single division called the "balance sheet group." It helped me to appreciate why the first of the liability accounts is "Capital stock" (the amount borrowed from the shareholders); and why the first of the asset accounts is "Plant and equipment."

35. *Balance Sheet Accounts of Interstate Commerce Commission's System of Accounting.*—As required by the Interstate Commerce Commission, the balance sheet accounts are as follows:

Asset Side.	Liability Side.
100. Plant and equipment.	160. Capital stock.
105. Other property.	165. Funded debt.
110. Securities.	170. Notes payable.
115. Cash.	175. Accounts payable.
120. Notes receivable.	180. Accrued liabilities not due.
125. Due from subscribers and agents.	185. Depreciation reserve.
130. Accounts receivable.	190. Other credit accounts.
135. Material and supplies.	195. Surplus.
140. Special funds.	
145. Prepayments.	
150. Other debit accounts.	

The numbers preceding each account, as shown in the foregoing list, and elsewhere in the reading matter, are those which have been assigned by the Interstate Commerce Com-

mission. The instructions in full detail concerning each of these 19 accounts, and how entries under each sub-account shall be made, are given on page 17 of the booklet, "Uniform System of Accounts for Class C Telephone Companies" which may be obtained from the Interstate Commerce Commission.

(To be Continued.)

Benefiting from "Telephony's" Reading Courses.

The Central Home Telephone & Telegraph Co., of Louisville, Ky., is one of the real live telephone companies which believes in getting the most possible benefit from the reading courses now running in TELEPHONY. It has organized classes in telephone accounting in all its plants which are in charge of the manager.

Under date of October 23 W. M. Brown, general auditor of the company, sent out a circular letter to the company's district and exchange managers giving instructions relating to forming the classes. It is through the organization of such study classes that the greatest benefit is derived from TELEPHONY's reading courses—both on the part of the employes and the company.

The circular sent out by Mr. Brown to the managers of the Central Home Telephone & Telegraph Co. is as follows:

"In the October 2, 1915, issue of TELEPHONY, page 23, a course in Telephone Accounting is begun. In our general office in Louisville we have organized a class in accounting, the members of which are the traveling auditor and his assistant, the cashier and her assistants and myself; our idea being to study very carefully, each lesson as it comes out and to devote at least an hour each week to discussing and arguing the different points brought out, *to the end that all of us may become more proficient in our several capacities.*

In talking over this matter with Mr. Heller, our general manager, I learned that he heartily approved of my suggestion to start a class in the general office, but he thought it very much more important and necessary to start the study of accounting and accounting methods in each plant throughout the entire system.

You will, therefore, have your cashiers, bookkeepers, toll clerks and any other of your employes, who desire to learn, begin with the October 2 issue, page 23, the study of the accounting course—*and the manager must have charge of the class.* I will ask that you go into this matter seriously and enthusiastically and that you give it your most efficient thought and work, because you need the knowledge of accounting very much, indeed. Although at this time, you probably—that is, some of you—have a general knowledge of the Class B, Interstate Commerce Commission accounting system, here is a chance to get an analytical study of telephone accounting, handled by an expert—and the only cost is the time you will devote to it. As a class, telephone managers throughout the entire country know very little about the plants which they manage, from an accounting standpoint, and I am sure that in these days in which we are all fighting to make a creditable showing in the efficiency ranks, a knowledge of what our plants are actually doing will be of great benefit, indeed, to our managers.

In our onward march we must not only keep posted on the evolutions and improvements which may affect the handling of the physical properties in our charge, but we must *know what we are doing from a standpoint of profit and loss.* Our present system for taking care of *stock material* has been pronounced adequate by several experts but, if for no other reason, a careful study of TELEPHONY's course is warranted, in that it emphasizes and explains the folly of neglecting the records of the material and supplies purchased, used and taken down or retired.

We are going to find it very interesting to study this course as we will undoubtedly run against many points about which we will wish to argue—and there is wherein the benefit lies. Our traveling auditor will examine you as he makes his rounds and your progress will be reported to the general office."

District Meetings of Iowa Independent Association.

The first of a series of district meetings inaugurated by the Iowa Independent Telephone Association, was held at Shenandoah, October 19. There was a good attendance of southwestern Iowa telephone men, and much interest was evinced in the meeting. M. H. Driftmier, manager of the Independent Mutual Telephone Co., of Shenandoah, spoke on the telephone situation, and A. B. Campbell, of the Engineering Extension Department of Iowa State College, Ames, Iowa, discussed "Depreciation."

On October 21 there was a district meeting at Le Mars, which was also well attended. Mr. Campbell repeated his talk on "Depreciation" and B. H. VanVliet, of the Farmers & Merchants Telephone Co., of Hawarden, spoke on "Accounting for the Small Companies." In both towns the local company was host to all visitors for dinner.

The subject of interference from high tension lines was up for considerable discussion at both of these meetings.

Dismantling of Clarksville (Tenn.) Home Company.

According to announcement made by the Home Telephone Co., of Clarksville, Tenn., service will be discontinued next Tuesday, November 1, and work of wrecking the wire system and dismantling the plant will be begun. This was considered to be the only course left open to the stockholders of the company, which sought some time ago permission to sell out to the Christian-Todd Telephone Co., across the line in Kentucky. Several objections were registered, which constituted the obstacle cited by the Federal authorities.

The principal stockholders are Ohio bankers. The company was organized 12 or 14 years ago, with an authorized capital of $150,000. It obtained a franchise, constructed a plant and began service. Later the capital was reduced by half, although not more than $67,000 of stock was issued. Equipment and other property of the company has been or will be sold, and the corporation will be dissolved.

Provisions of Bell Company's Workmen's Compensation.

The Central Union Telephone Co. was one of the corporations in Indiana to refuse to come in under the workmen's compensation law, the Indiana Industrial Board permitting it to provide instead its own compensation. It was found that in every provision the Bell company's compensation was better than that required by the Indiana law.

The law, for instance, provides nothing for a total disability injury for the first two weeks, and then 55 per cent. of the earnings for 500 weeks. The company provides full pay for thirteen weeks and 55 per cent. of the weekly wage for the term of the disability, no matter how long. The company pays full loss for thirteen weeks on partial disability, and 55 per cent. for six years. The law provides nothing for two weeks, and 55 per cent. for 300 weeks. The state allows hospital expenses for 30 days, the company for the full period of disability; the state provides $100 for burial expenses, and the company $150; the state provides 55 per cent. for 300 weeks in case of death, and the company pays full wages for three years, but not to exceed $5,000. In addition, the company provides old age pensions.

New Toll Lines Between Eau Claire and Chippewa Falls.

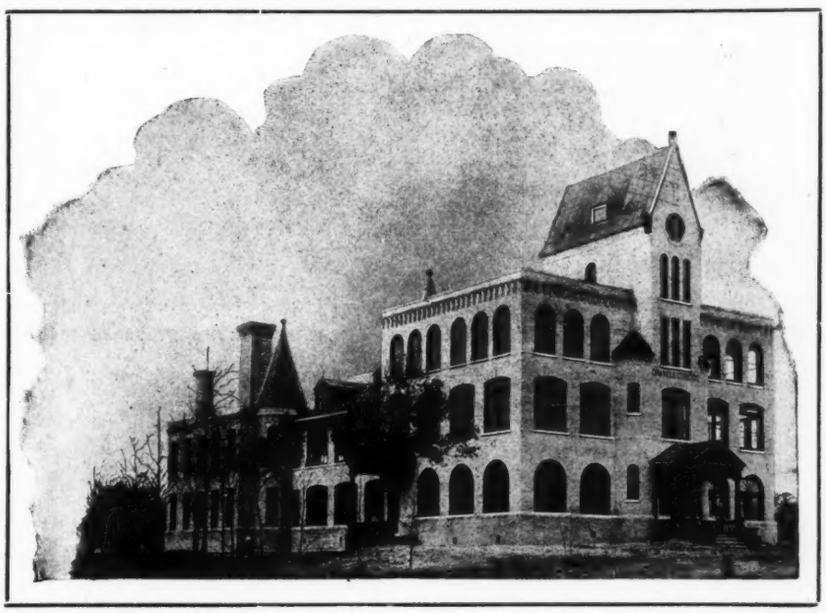
The Wisconsin Telephone Co. recently approved an estimate for additional toll and trunk lines between Eau Claire and Chippewa Falls, Wis. The estimate amounts to $13,000 and covers the building of an entirely new 40-wire pole line to replace the present two-pole lines.

An Independent Telephone Manufacturing Plant's Growth

Story of the Kellogg Switchboard & Supply Co. from the Original Factory in Highland Park, Ill., to the Large, Modern Plant Now Occupied—Interesting Sidelights Upon the Company's Progress to Its Present High Position in the Telephone Field

By Edw. Hamilton

Such are the wonders of time that man has but to open his eyes to witness a procession of events, achievements and feats of which he could not even dream of yesterday. And when one stops to consider the billions of yesterdays—each with its quota of achievements, each with its audience of millions who are either passively looking on or doing an individual share toward the harnessing of thought which will culminate in an achievement — he cannot but wonder what the morrow will bring forth.



The First Home of the Kellogg Company at Highland Park, Ill.

That today is no different from yesterday, insofar as the striving, groping and achieving of master intelligence is concerned, is obvious, as everything since the dawn of history points to this aggressive ambition through striking results—artistic, structural and mechanical.

Small wonder, then, that with each tomorrow the possibilities grow and finally unfold into a flower of achievement which will bloom on forever improved by evolution in order that its hue may blend with the general color scheme, as today swiftly makes way for tomorrow.

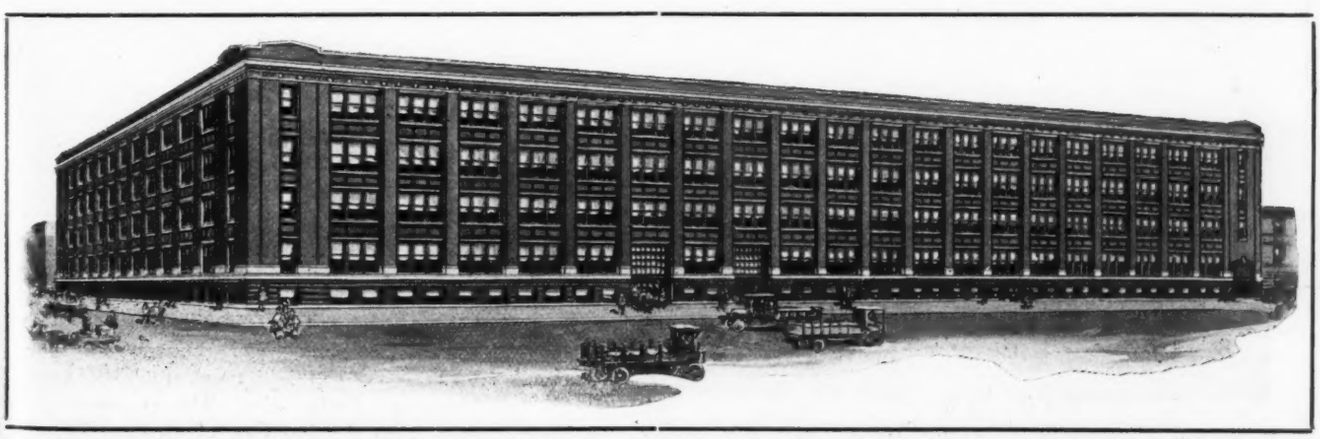
As we enjoy the results of an achievement, it is interesting to hark back to the yesterday of its inception and watch it gradually round out into its present perfection. So, in 1897, we see the incorporation of the Kellogg Switchboard & Supply Co., a small plant in operation at Highland Park, Ill. Here, in a one-time school building, Milo G. Kellogg, a genius and a pioneer, threw down the gauntlet in the face of monopoly and unfurled the banner of Independence, while his co-workers, able men all, broadened under his generalship.

The new Kinloch Telephone Co., at St. Louis, Mo., had in a year grown to the point where its requirements demanded a larger and more adequate switchboard. A careful scanning of the manufacturing field prompted the belief that Milo G. Kellogg was the man into whose hands this important task should be entrusted.

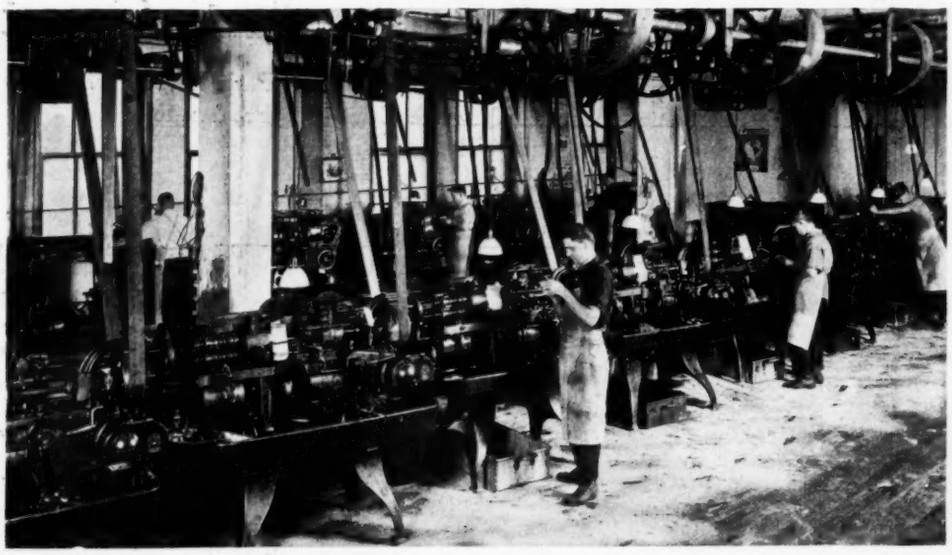
In the little Highland Park factory was conceived the gigantic St. Louis switchboard. **There it was built, completely and successfully,** as its immediate installation and long years of service have proven.

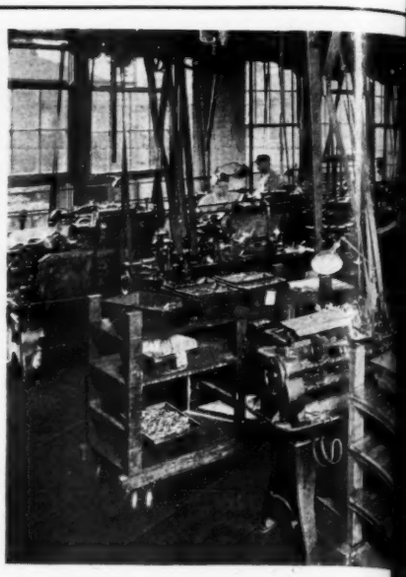
The building of that switchboard, the largest in the world, was, indeed, a masterstroke—a daring undertaking on the part of the young manufacturing institution, and its ordering a step as wise as it was daring on the part of the Kinloch Telephone Co. Indeed, a splendid tribute to the genius of the manufacturer and the judgment displayed by the Independent telephone company, is the fact that after years of constant use many of the original Kellogg switchboards are still in service.

And then there were many other famous Kellogg exchanges, and many of these earlier installations are still in service. Notable among these first big switching plants for the wonderful service which they gave for their time, that aroused the world to the value of Kellogg equipment



The New Plant of the Kellogg Switchboard & Supply Co., Aberdeen and Adams Streets, Chicago—a Modern Establishment.

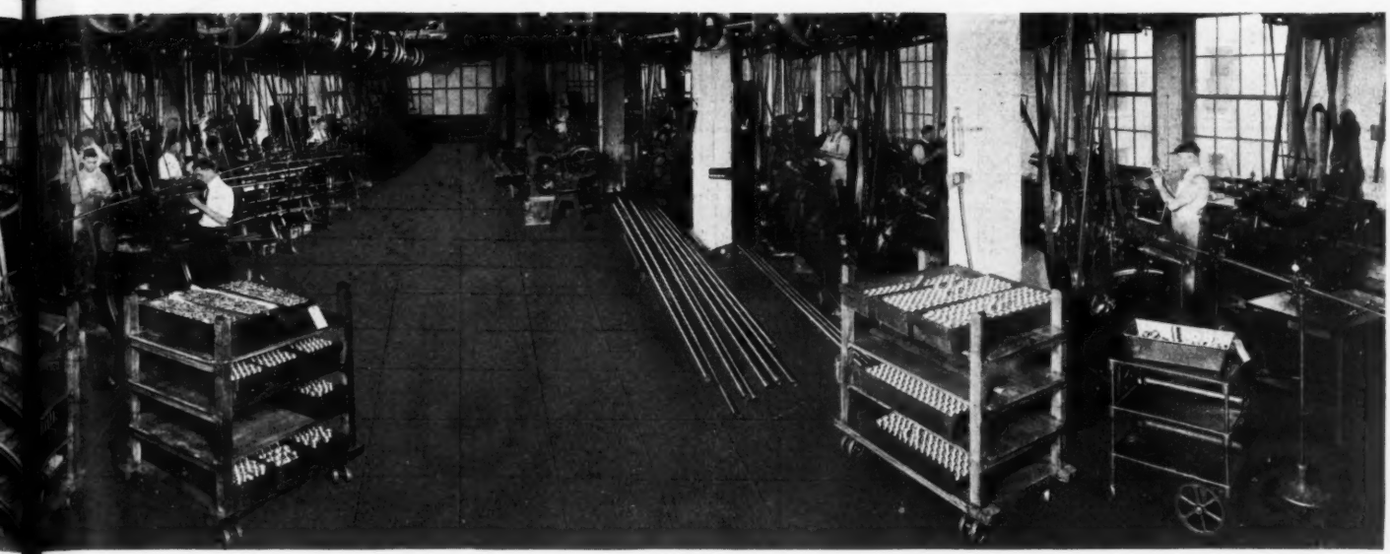




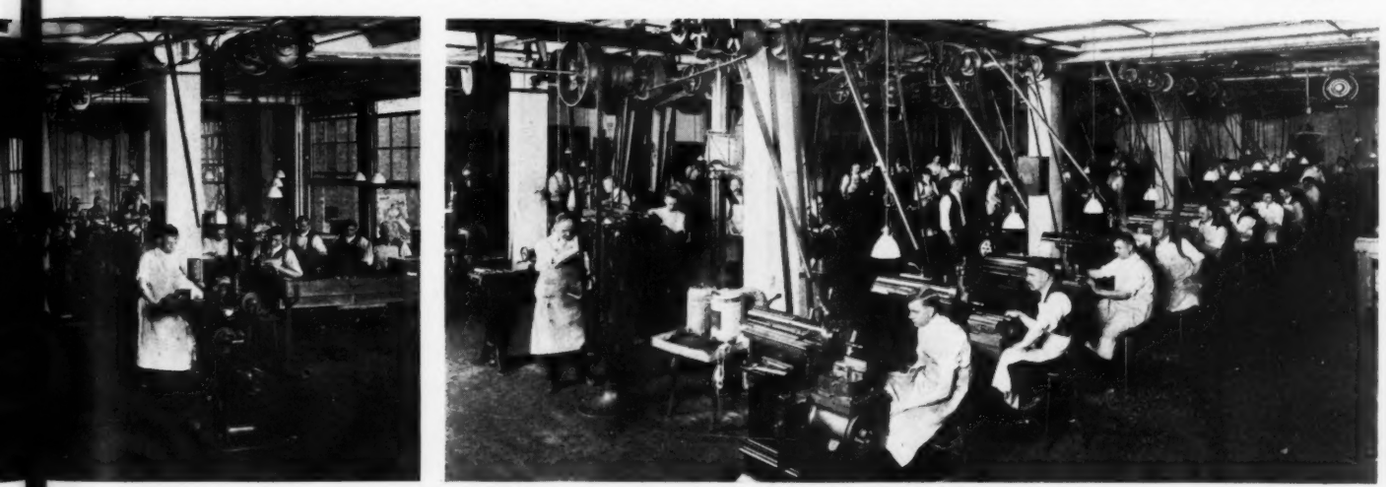
Sections of Automatic Screw Machine Department in the Kellogg Plant.—Here Are Produced the Special Parts Used in Telephone Equ

Views in the Tool Room Where All the Various Tools Required for Manufacturing Telephone Equipment Are Mad

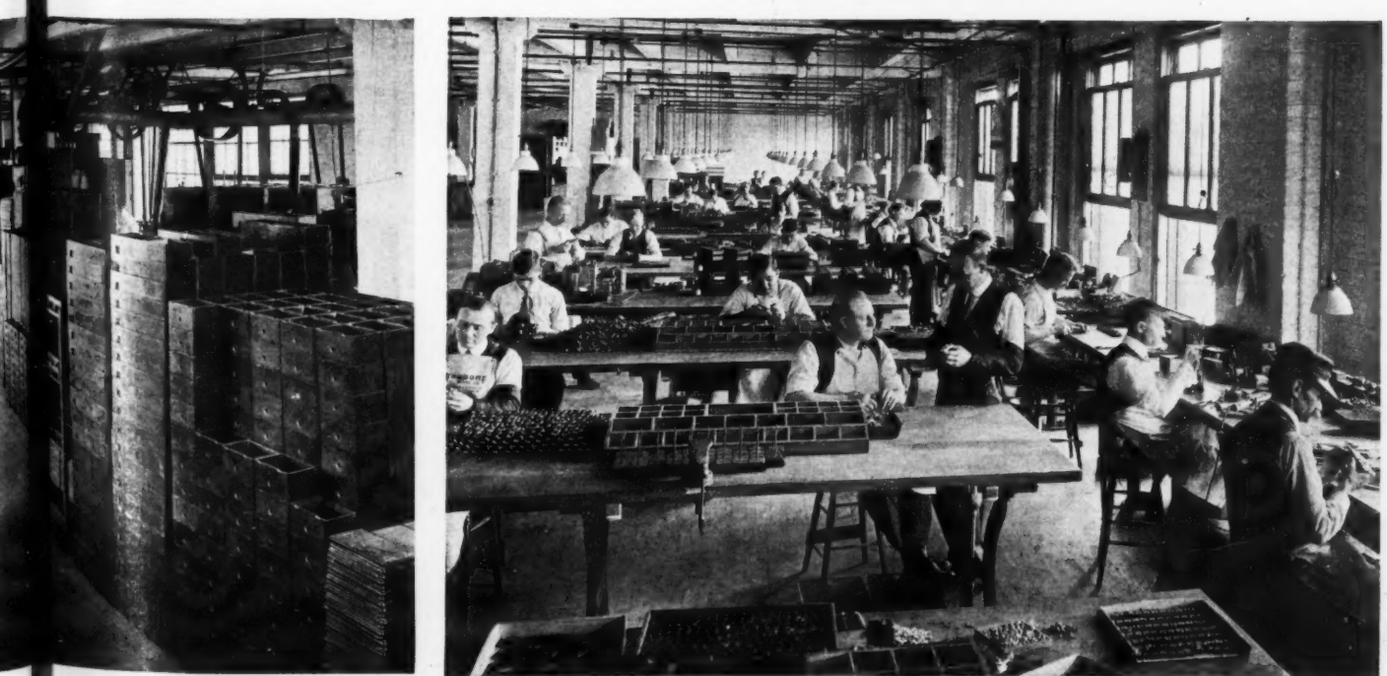
The Telephone Assembly Department Where the Parts of Desk Stands and Subscribers' Instruments Are Taken and Assembl



...hines Automatically Perform from One to Six Operations, in Shaping, Threading, and Cutting in the Turning Out of a Perfect Product.



...es Are Shown on the Left, a Battery of Milling Machines in the Center and a Group of Shapers on the Right.



...e Stockroom and Telephone Cabinet Shop is Shown on the Right.—The Department Where Telephone Relays Are Assembled.

were: Buffalo, N. Y.; London, England; Scranton, Pa.; Odessa, Russia; Cleveland, Ohio; Philadelphia, Pa.; Indianapolis, Ind.; Los Angeles, Cal.; Baltimore, Md.; Albany, N. Y.; Canton, Ohio; Logansport, Ind.; Columbus, Ohio; St. John, N. B., Can.; Hamilton, Ohio; Jackson, Mich.; Johnstown, Pa.; the big Minneapolis toll board; Pasadena, Cal.;

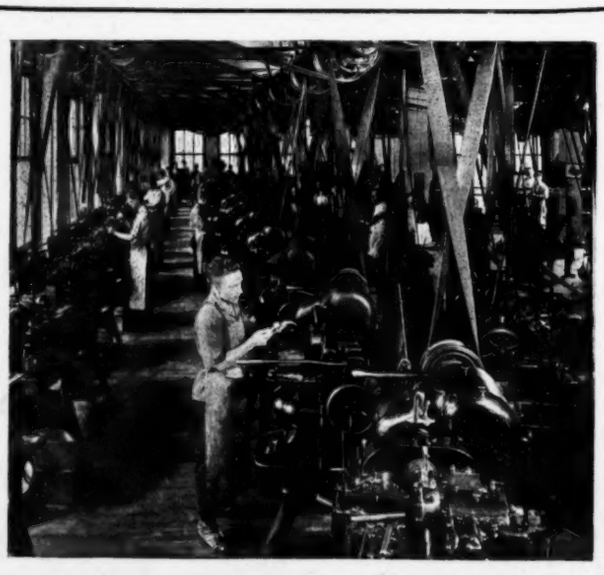
Powerful Punch Presses Stamp Out Various Kinds of Pieces.

Raleigh, N. C.; Redlands, Cal.; Santa Barbara, Cal.; Vincennes, Ind., and Webster City, Ia.

Some of more recent type and new and interesting Kellogg switchboards are found in the equipment furnished for Santos, Brazil; Wusieh, China; Sao Paulo, Brazil; Janesville, Wis.; Ashland, Ohio; Ft. Dodge, Ia.; Hoopeston, Ill.; and Portsmouth, Ohio.

Of the famous Kellogg instantaneous recall boards there are: Painesville, Ohio; Troy, Ohio; Sewickley, Pa.; Bellevue, Pa.; Oakmont, Pa.; Canonsburg, Pa.; St. Petersburg, Fla.; Greenfield, Ind.; Chippewa Falls, Wis.; Alpena, Mich.; Portage, Wis.; Hillsboro, Ohio; Rice Lake, Wis.; Tipton, Ind.; Moultrie, Ga., and Warren, Ohio.

Many of the older boards in service have been rehabilitated with the Kellogg instantaneous features. Among these exchanges may be mentioned: Moxham, Pa.; Johns-



Automatic Machines Are Indispensable in a Modern Factory.

town, Pa.; Cleveland, Ohio—Central, Union, and Crest exchanges; La Crosse, Wis.; St. John, N. B., Can.—Main and West exchanges; Red Wing, Minn.; Pomona, Cal., and High Point, N. C.

The thousands of plants of the most modern Kellogg magneto and common battery equipment throughout the country today are the certain evidence of Kellogg standard.

In a brief time the Kellogg company left Highland Park for Chicago, necessity having demanded more commodious quarters, closer touch with skilled labor and contiguity with more ample shipping facilities.

The switchboard for the Kinloch Telephone Co. had been built and installed bearing the now world-famous Kellogg nameplate, and the pioneer had blazed the trail which opened the way to Independence. Nor was Independence the only aim of this small but aggressive fighting force, for it constantly looked to the betterment of its product that it might, from a standpoint of scientific construction, stability and efficiency, forever stand in a class by itself. The wisdom of this forethought and adherence to all for which it stood during the succeeding years, has been amply proven by the success of the company.

Again, we see the constantly increasing business compelling a change of quarters, when, in 1902, the eight-story building at the corner of Congress and Green streets, Chicago, became the home of the Kellogg Switchboard & Supply Co. When the company moved to the Green street

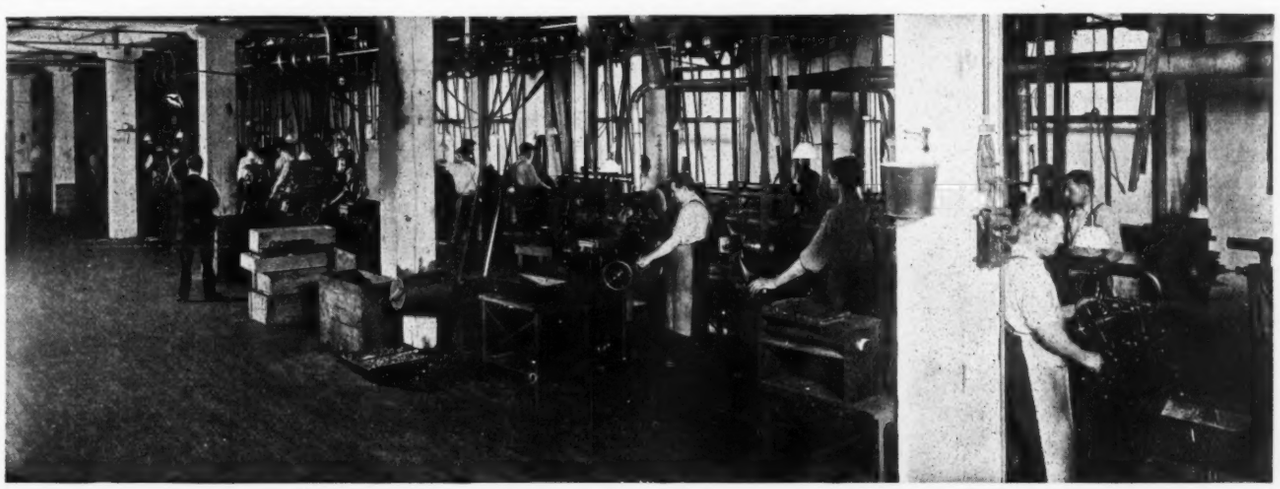
Accuracy Is Essential in the Tool Room and Die Department.

plant, to enlarged quarters and better manufacturing facilities, there was given to the telephone world the first lamp signal common battery switchboard in the Independent field; also the self-restoring drop and jack of the shutter type.

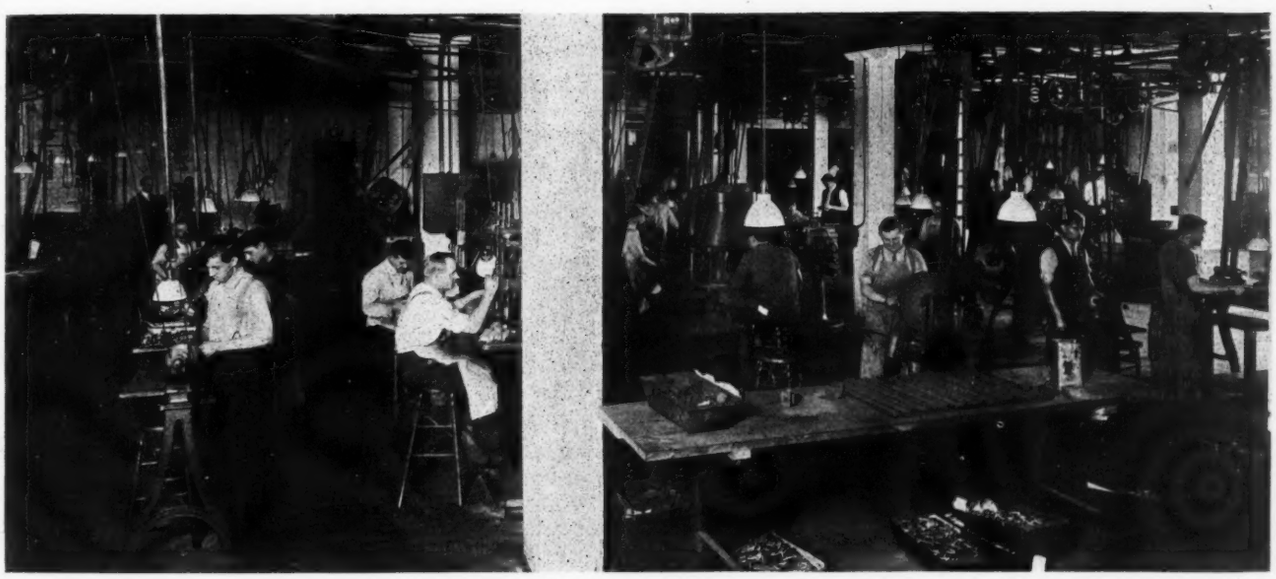
At this time the Kellogg company placed on the market the first harmonic selective ringing telephone, at once the leader and far ahead of any imitating attempt. This equipment, like the Kellogg drop and jack, is known the world over. The use of this harmonic system, with its vast saving in maintenance and the splendid service it made possible, has contributed as much to the success of the Independent movement as any other advance in the field.

In its early days the Kellogg company manufactured only common battery apparatus, but its first magneto switchboard—which, by the way, is still working today—represents a type that was the talk of the telephone world. These boards have held their place as leaders in giving the finest magneto telephone service, and the thousands in arduous service under all circumstances prove the value of the Kellogg idea, "Kellogg equipment is built up to a standard and not down to a price."

Every improvement in Kellogg switchboards—the complete Kellogg line from refinements of minutest parts to ringing equipment—has been brought about by untiring en-



A View of the Milling Machines Where Parts of Telephone Apparatus Are Milled or Cut to the Required Dimensions.



Some of the Lathes and Drill Presses for Miscellaneous Work.— Generator Manufacturing Department at the Right.

Generator Armatures, Gears, and Frames are Carefully Assembled and Adjusted, After which the Magnets are Added.

ergy, and the foremost idea has ever been to produce a telephone equipment that will best serve the interests of the Independent telephone operator.

From a Kellogg wall telephone in the hut of the mountaineer to the malleable iron mine set operating thousands of feet below the earth's surface, special and particular

In This Department Multiple and Answering Jacks Are Assembled.

types of telephones have been built and standardized for use in out-of-the-ordinary service conditions.

Kellogg railway equipment is operating today on many of the longest and best known lines and giving service on a par with the Kellogg ideal.

The individual parts of all equipment, such as lamps, condensers, insulating material and the thousand things that go to make a standard finished article, are built at the Kellogg plant with unsurpassed facilities for their correct production. No one can visit the Kellogg lamp department, for instance, or the condenser department, without being impressed with the thoroughness and the care put forward in the production of this satisfactory apparatus.

On a twelve-acre tract, the immense woodworking plant

After Being Plated, the Pieces Are Polished.

is located at Cassopolis, Mich., where constructive efficiency is patterned after the main plant. Here are eight well-lighted, roomy buildings with the most complete machinery. In addition to these, there are two warehouses and a complete dry kiln. In fact, there is in every way a modern woodworking establishment built with a particular idea of producing the highest grade telephone boxes and switchboard cabinets.

Today there are over 9,000 switchboards in service bearing the Kellogg nameplate and over a million and three-quarters of the famous reverse type Kellogg transmitters.

Not only has this equipment won an enviable name and reputation at home, but it has been adopted as standard by several European governments. Well may it be said today that Kellogg apparatus is in service on the four quarters of the earth.

Many of the most important and attractive improvements in the telephone field have been originated by this company. This has resulted in constant imitations by its competitors, and nowhere is this more effectively mentioned, as an example, than in the Kelllogg instantaneous recall board. The wonderful combination of advantages in this switchboard, as combined and put on the market only by the Kellogg company, has not only been imitated far and near, but copying companies have actually claimed this invention as original with them, imitating names as well as apparatus.

In the last eleven years, much telephone history has been written with monopoly on one side and the Independent manufacturer on the other. The business of the

A View in the Hand Screw Machine Department.

Kellogg Switchboard & Supply Co. increased by giant strides, until today it stands the largest Independent telephone manufacturing company in the world.

What more fitting then, than a permanent home for this vast and growing institution—a home, itself susceptible to structual growth when occasion demands, to stand forth as a monument to a wonderful achievement and a wonderful man.

Situated on the corner of West Adams and Aberdeen streets, Chicago, is the immense new four-story and a ground floor building with a frontage of 396 feet on the former street, and 238 feet on the latter—one-half of a city square. Here, with a floor area of 404,888 square feet —over nine acres of floor space—is the new home of the Kellogg company.

An unusual feature is the division of this great floor area into separate buildings with interior light courts which insure a maximum daylight from every angle. This superior illumination, coupled with the best mechanical equipment that money can buy and the highest grade of skilled workmen, can only make for perfection in product.

Although the company has occupied the new plant only a few months, it has already become a show place for visiting telephone men in Chicago. They spend many profitable hours in its many departments, studying switchboards, telephones and telephone apparatus in the making. These

A Section of the Department in which the Various Kinds of Telephone Switchboard Keys Are Assembled.

Switchboard Cable and Wire Department.—Wire is Wound on Standard Spools, which are Then Weighed and Marked.

Kellogg Enamel Department, Where the Wonderful Insulating Covering of Kellogg Telephone Apparatus is Prepared and Applied.

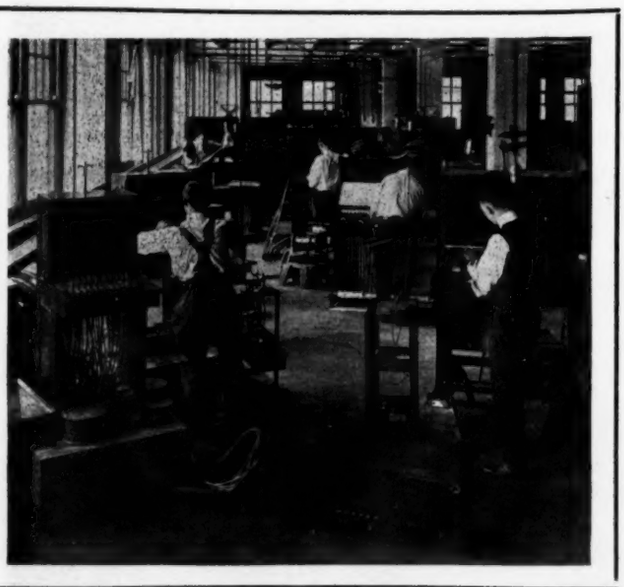
visitors are welcome to any courtesy which the Kellogg organization can confer upon them, since in a large measure, it owes to them and their predecessors, a success unparalleled in the world of Independent telephony.

A visitor on entering this immense and magnificent plant, parts with the commonplace. He does not see a "factory" in the usual meaning of the term, where there is grime and dirt and dust and shadows and dripping oil. He enters a

A View in the Coil and Condenser Department.

manufacturer's fairyland of huge, white painted rooms, with high ceilings, where from process to process and from department to department, amid the whir of a thousand motors and the thunder of mighty presses, take shape before him gradually, yet with wondrous speed possible with twentieth century methods, the Kellogg telephone and the Kellogg switchboard. He sees them in the rough material, shaped and finished, packed and shipped.

Here, indeed, is efficiency in the making! Even present-day commonplaces of the manufacturer are seen in a new light in this place. For instance, in the plating depart-



Switchboard Wiring Department Equips Many Types of Boards.

ment, the visitor sees completeness of equipment and skill in the handling, with freedom from the disagreeable features ordinarily accompanying plating department operations. He sees telephone gongs really nickel-plated—a plating put on to stay, heavy enough to last through the fifteen years of profitable service as exemplified in the earliest Kellogg sets still operating.

He sees the wonders of the switchboard lamp rooms where the big mercury pumps encase the tiny delicate filaments in their vacuum houses of glass, destined to light at the command of subscriber and operator for many years.

He sees the glowing furnaces where parts are annealed and where an early glimpse of Kellogg generator magnet bars—white hot—are obtained.

The newer Kellogg Bakelite sections fascinate him. There a handful of powder made of fiber dust and two wondrous chemicals, poured into polished steel dies and in the grasp of a hot hydraulic press, are turned out in an eye-wink almost, finished telephone receivers—a twentieth century miracle, indeed. Here are made not only Bakelite receiver shells, but Bakelite transmitter mouthpieces and head receiver shells. This marvelous material of immense strength, unbreakable in ordinary service, unwarpable, of fast color, with permanent polish, odorless, very light, is, in fact, the ideal insulating material.

With little deviation from the basic principle of the original

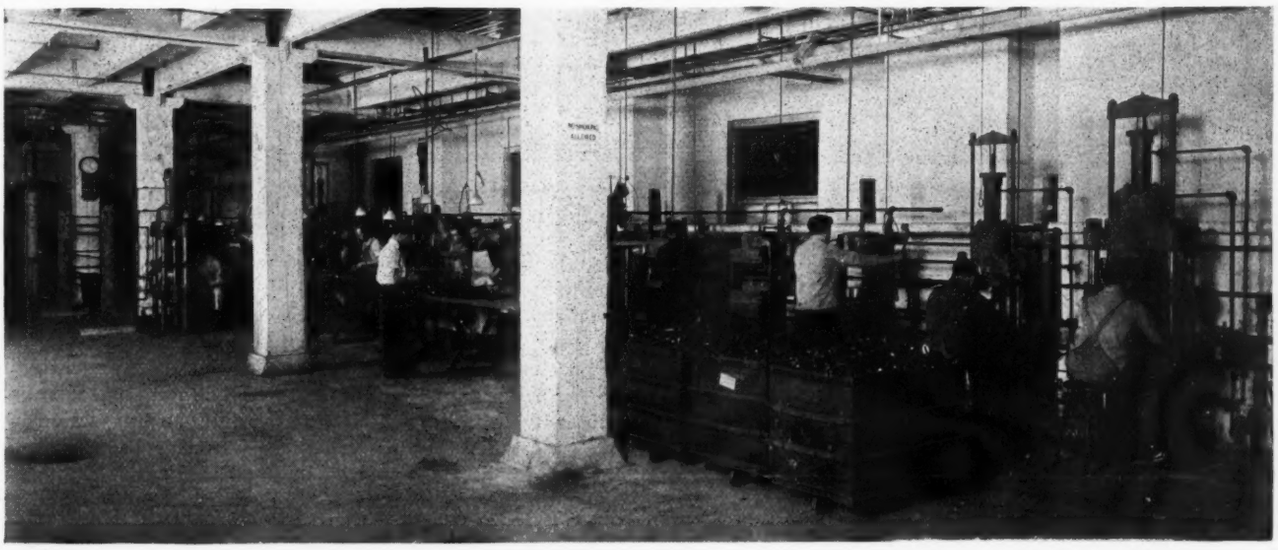
All Apparatus is Inspected and Packed by Experienced Men.

electrical talking device, the appointments of the telephone today indicate the most careful study. This is especially marked in the construction of the telephones, switchboards and telephone apparatus.

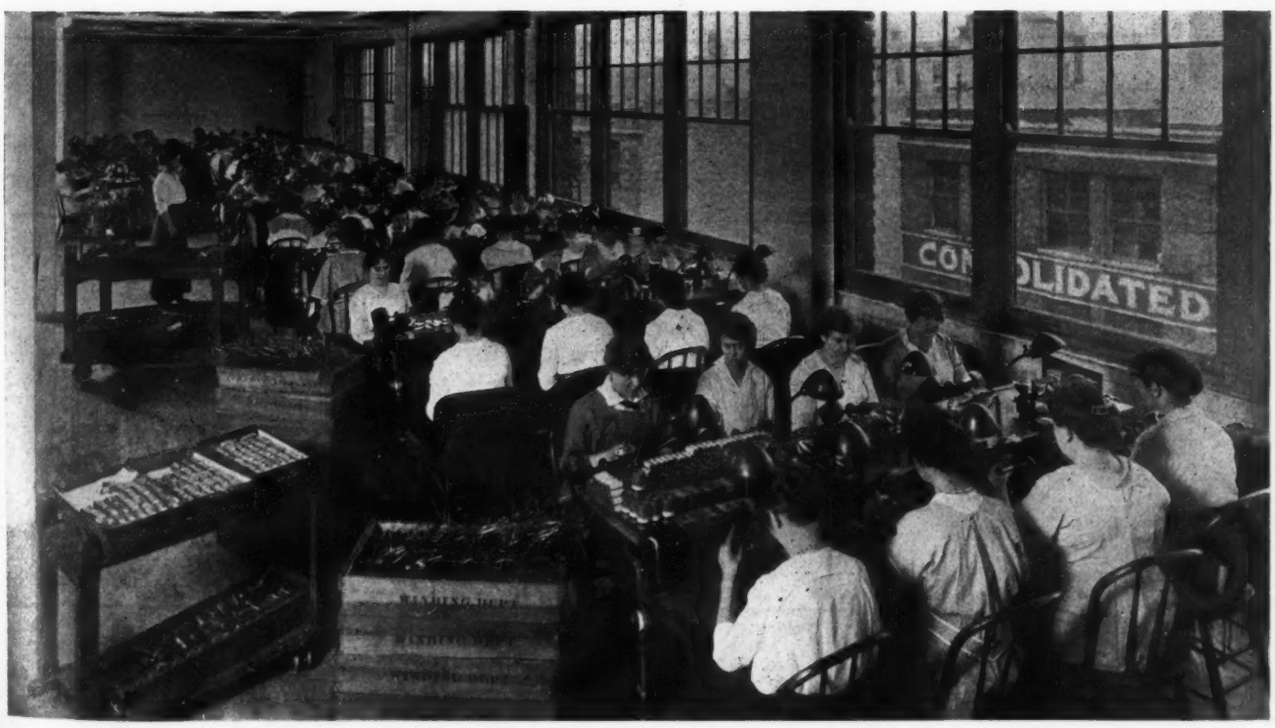
For years the Kellogg company was confronted by a problem which still annoys manufacturers—how to construct an unbreakable transmitter mouthpiece and receiver shell. Hard rubber had primarily been selected as the only suitable material, it not alone being impervious to moisture but also a non-conductor of electricity. However, its drawbacks were serious in that its liability to breakage and damage added materially to the overhead expense of the telephone exchange. The first step of the Kellogg company toward relieving this condition was in the exploitation of its now famous steel-reinforced shell and mouthpiece. This departure obviated the old trouble to a great extent, thus reducing the expense of upkeep. Nevertheless, the visible material was still hard rubber and the manufacturer of the article, despite highest praise and unqualified satisfaction on the part of the user, was not satisfied.

Then came the marvelous discouvery of Dr. L. H. Baekeland after a quarter of a century of research in the field of pure and applied chemistry—Bakelite. Bakelite is a substance which, in its different forms, offers the advantages of hard rubber, Japanese lacquer and celluloid, having unlimited commercial uses. However, the construction of the new Kellogg receiver shell and mouthpiece has only to do with Bakelite in its final stage, when it becomes as hard as flint and practically indestructible.

All Telephones Are Tested After Being Assembled.—A Section of the Switchboard Key Department.

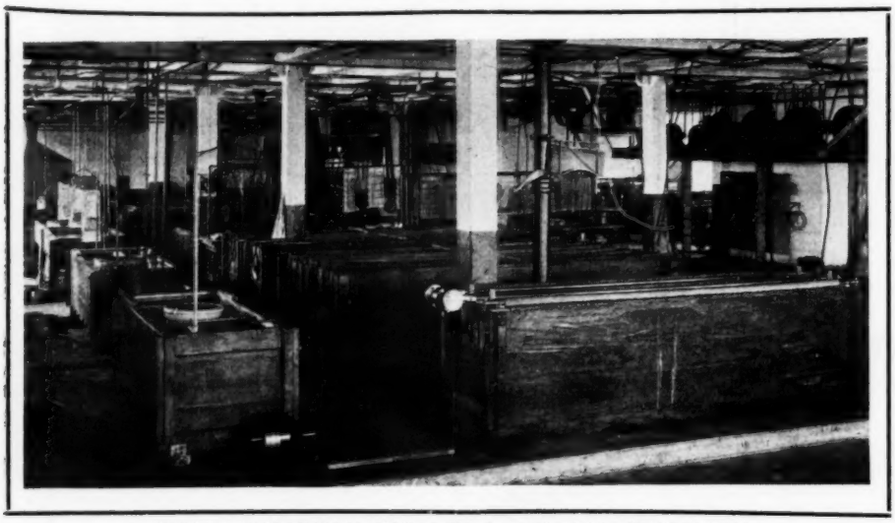


Corner of Bakelite Department, Showing Powerful Hydraulic Presses Used in Manufacture of this Insulating Material.



In the Coil Winding Department are Wound the Many Kinds of Coils Required for Telephone Apparatus.

It is infusible and can resist a temperature of 572° Fahr. (300°C). It is insoluble in all solvents and can withstand strong chemicals, oil, hot water and steam. It does not emanate sulphur like hard rubber, and when subjected to a flame does not suddenly catch fire or melt like rubber, but simply chars and finally, at a temperature of melting glass, it carbonizes.



A View of the Electroplating Equipment of the Kellogg Plant.

It is quite remarkable that in the formation of Bakelite, two strong smelling liquid substances (carbolic acid and formaldehyde) should under certain well defined conditions react chemically upon each other and solidify to a substance entirely devoid of odor or taste.

The Kellogg company, quick to recognize the merit of Dr. Baekeland's discovery, installed special machinery for baking the composition under high pressure and after a long series of experiments wherein the product was subjected to every possible test, the new Kellogg-Bakelite specialties were pronounced perfect. The receiver shell is light in weight, artistic in design and of a permanent glossy black which no amount of handling will rob of its luster. The shell is calculated to withstand severest use and abuse and at once relieve the telephone company of that hitherto unavoidable expense entailed through breakage.

The great screw machine departments where so many parts of telephone and switchboard apparatus are produced automatically with almost human intelligence, are revelations to the mind of the layman unfamiliar with such machines.

From the automatics and well-ordered and splendidly arranged stockrooms, the visitor is taken through the wonderful enameling rooms, the cord department, the winding room and a score of other activities of equal interest; then to the engineering department where are shaped the practical ideas of practical telephone men, the drafting room, the experimental laboratories and the switchboard assembling sections. These latter are on the first floor, as are also the executive offices, which, be it said, are not equipped with costly rugs, mahogany furniture, or gold-framed pictures. They are just ordinary, bright, sunny, plain business offices.

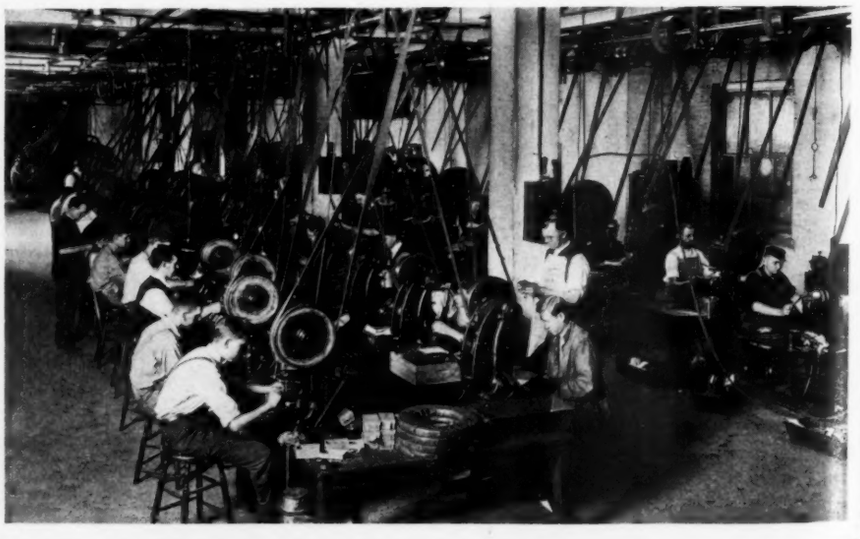
The auditing and order departments, the sales and advertising departments, and finally, the big display room, where the Independent telephone manager can see every type of Kellogg apparatus exactly as he saw it in the factory and exactly as he can see it in thousands of installations throughout the country, are next in order. Here is installed a magneto wall switchboard suitable for the rural switching station. On the other side of the room is the handsome common battery multiple section—the instantaneous recall switchboard which is proving its great worth and epoch-changing advantages already in a score of exchanges throughout the country. On exhibition also are the various sizes of Kellogg magneto boards and Kellogg P. B. X. equipment, as well as special sets, including telephones adapted for railway work.

Upon leaving, the visitor is impressed again with the value of the Kellogg slogan—its adaptability to this plant. Here, indeed, is a factory wherein, "Use is the Test."

Patrons Inspect New Exchange.

Patrons of the Consolidated Telephone Co., at Allentown, Pa., were recently given an opportunity to inspect the new automatic exchange and building of the company. Under the care of an official or employe of the company, the visitors were taken on a tour of inspection, starting in the basement, where they were shown the large cables leading in from the ducts in the street and bringing all the wires into the building. Through the basement the cables were followed, and meanwhile an inspection was made of the power machinery and storage battery system located in fireproof booths in the basement.

To the second floor the cables were then followed and the distribution system after the wires leave the cables was inspected, leading to the most interesting part of the automatic system, the selectors. These selectors acting with almost human intelligence picking out the lines desired by subscribers, giving notice if line is busy and automatically releasing the lines used for further service when a conversation is concluded, caused the greatest amount of interest.



Punch Press Department Produces Various Kinds of Punchings Used in Telephony.

The plant, which is a model for neatness and compact-

ness received much praise and everybody was highly pleased with the inspection.

The visitors were personally welcomed by District Superintendent Herbert H. Weibel, and then taken in charge by some one or other of more than a dozen capable dem-

In the Engineering Department, Specifications Are Drawn.

onstrators of the intricacies of the system. In the force were: Allen T. Frederick, chief salesman for the company and the man who wrote the first contract for the company in 1899; Salesmen E. W. Willenbecher and Ernest Shelling, Wire Chief F. C. Lausterer, Chief Clerk P. C. Romig, Chief Switchman Lloyd Ritter, Switchmen Carl Harding, Herbert Stahl and William Willenbecher, Inspectors William Grant, Chas. Hoffman and John Fetzer.

Extension of Time Under Valuation Order No. 18.

The valuation division of the Interstate Commerce Commission has extended the time for making the reports called for from telephone companies under Valuation Order No. 18. The original order required all "A" and "B" class companies to whom the order was directed, to file the reports by September 30, 1915. It has been found that the amount of work involved on the part of the companies has been such that few were able to comply with the order by the time specified, and so many asked for an extension of time that the commission, after a thorough investigation, decided it would be best to give the companies six months longer in which to report.

The commission, however, is notifying companies that it will be necessary for them to make report of purchases of materials made in 1913. The data for this year was not called for under the original order when it was issued several months ago.

The commission says in regard to this matter: "In this connection notice is hereby given that cost data figures, the same as required for 1914 and prior years, will be called for for the purchases made in 1915, and may or may not be incorporated in your report under Order 18, just as you see fit. In the event the 1915 figures are not incorporated in the report, your company is requested to file the same in a separate report not later than July 1, 1916."

Many managers will welcome this extension of time.

Monmouth (Ill.) Company takes Prize in Parade.

The Monmouth Telephone Co., of Monmouth, Ill., was awarded first prize in a parade recently held by the merchants and manufacturers of Monmouth, for the most beautiful and original float. The telephone company's float consisted of a switchboard with an operator seated before it in the act of answering calls and making connections. The rear was fitted up as a living room of a home. Here was seated an employe of the company talking over a telephone. From a decorated telephone pole ran a score or more of ribbon streamers to as many girls dressed as operators, and each carrying a small sign bearing the name of a large city of the county, indicating the extent of the telephone business. The girls were neatly attired in white and blue and the decorations on the float were of the same colors.

New Members of A. I. E. E.

R. V. Achatz, instructor in telephone engineering, Purdue University, Lafayette, Ind., has been transferred to the

The Shipping Department is a Busy Place.

grade of member of the American Institute of Electrical Engineers, and H. J. Pettengill, president of the Southwestern Bell Telephone System, St. Louis, Mo., has been elected member. The following associates have also been elected: E. B. Glover, chief inspector, Mutual Telephone Co., Erie, Pa.; H. F. Hill, vice-president of the Central Group of Bell companies, Chicago, and J. D. Trainer, engineering department, Western Electric Co., New York, N. Y.

The Office Is Equipped with Modern Stock Index Desks and Efficient Records.

Proceedings Before Commissions, Courts and Councils

Discussions and Rulings of State Bodies Having Supervision of Telephone Companies, Decisions of Courts in Matters Affecting Public Relations of Utilities and Actions of City Councils Bearing Upon Franchises, Rates and Service

Advocates Adoption of Uniform Telephone Rates.

Adoption of uniform rates for telephone service was declared to be the only solution of the present problem of discrimination by Chairman C. A. Reynolds, of the Washington Public Service Commission, at the meeting of the National Association of Railway Commissioners in San Francisco, Cal., this month. Mr. Reynolds said:

"The gradual regulation of telephones throughout the country will be solved by the adoption of uniform rates and practices under like conditions throughout the United States. Discrimination in rates or service is intolerable and should be eliminated.

The wide divergence of telephone rates is without justification or excuse, and if regulation does not provide a speedy remedy, the condition will give rise to renewed and more formidable agitation, which will ultimately lead to governmental ownership.

Whatever we may say to the contrary, regulation as to rates and service has not been accepted by the public, generally, as an answer to the discrimination and extortion on the part of public utilities, and its acceptance or rejection as the final answer, depends on the energy with which commissions eliminate conditions of discrimination and extortion intolerable to the public."

Telephone Consolidation in California.

There has been filed with the attorney general's office in the Department of Justice, at Washington, D. C., the application by the Pacific Telephone & Telegraph Co. for permission to acquire the controlling interest in the Sacramento Valley Telephone Co. which is to be organized for the purpose of consolidating the properties of the Glen County Telephone Co., the Tehama County Telephone Co. and the plants of the Pacific Telephone & Telegraph Co. competing with those Independent properties.

This is one of the consolidations contracted for in 1912, the consummation of which has been delayed from local causes. It is therefore stated that this proposed consolidation does not violate the so-called Kingsbury agreement with the attorney general. The Independent companies do not do an interstate business, having no toll lines that reach any point outside of the state. This makes the property entirely an intra-state matter. The two Independent companies now have about 1,600 subscribers and the properties which the Pacific company intends to transfer to the Sacramento Valley Telephone Co. about the same number. As there are about 600 duplicates, the consolidated system will have about 2,600 subscribers to begin with.

Cost and Use Factors in Fixing Rates.

At the hearing on the application of the DeKalb County Telephone Co., of DeKalb, Ill., for increase in residence telephone rates in DeKalb and business telephone rates in Sycamore, before the Illinois Public Utilities Commission in Chicago, October 26, an unusual complaint was made. The cities of DeKalb and Sycamore have entered an objection to the increase which sets forth their reliance upon the commission and its experts to establish the proper valuation of the company's plant. But, in view of the present discrimination of their rate schedule, including the practice of free toll, the increase asked for was objected to and a request made for the establishment of an entirely new rate schedule. This new schedule, it is contended, will give the company a fair return on its investment. In getting up the new schedule the cost and use factors, which may be determined upon by expert investigation, were employed.

Acknowledgment was made by the objectors that the company is not now receiving a fair return on its investment, and an effort was made to assist the company to arrive at a satisfactory understanding with the commission.

The field investigation of the plant valuation was in charge of A. H. Krom, telephone engineer of the commission, while the cities of DeKalb and Sycamore were represented by Garrison Babcock.

The hearing was adjourned for two weeks, at which time it is expected that definite action by the commission will be taken in this matter.

Proposed Consolidation in Kansas.

The American Telephone & Telegraph Co., in behalf of one of its subsidiaries, the Missouri & Kansas Telephone Co., has notified the Department of Justice of its desire to carry to completion a contract entered into in 1912 for the consolidation of its plants at Pittsburg and Parsons, Kan., with the properties of the Citizens' Home Telephone Co., and the acquisition by the Missouri & Kansas Telephone Co. of a number of small exchanges in the vicinity of those two cities now owned by the Citizens' Home Telephone Co.

The Citizens company has been in financial difficulties for some time, having passed through a receivership. At Parsons the Citizens company is operating 500 stations and the Bell 2,232. At Pittsburg the Citizens company has 1,000 stations and the Bell 2,346. Therefore, the net gain in subscribers to the Bell company, it is said, will not be very great.

This consolidation has not as yet been agreed to by the Kansas Public Utilities Commission, whose consent, of course, must be obtained. Inasmuch as the contract to purchase these properties was entered into in 1912, it is stated in the application to the Department of Justice that the Bell company considers itself entirely within its agreement with the Department of Justice in effecting this consolidation.

Hearings in Maryland Telephone Rate Case.

R. T. Marye, counsel for the Chesapeake & Potomac Telephone Co., testified at the hearings held last week in the Maryland telephone rate case. In summing up his case, Mr. Marye said the differences between him and People's Counsel Osborne I. Yellott were so slight that they "could be covered with a lady's handkerchief." As a matter of fact, the differences between the company's and the people's sides have to do almost entirely with the valuation to be placed upon the company's intangible assets. The opposing sides are in agreement as to the value of the physical property of the company, which is placed at approximately $10,000,000.

The company is contending for a considerable addition in the valuation to cover its easements, going-concern value, working capital, etc. Mr. Yellott has contended that the company should be allowed $1,000,000 for its intangibles, making the total valuation $11,000,000. Of this $1,000,000 for intangibles, he argues that $500,000 should be allowed for easements, going-concern value, etc., and $500,000 for working capital.

In his argument, Mr. Marye reasoned that the sane and practical way to ascertain the true value of the property

of a public utility is to go to the books and ascertain the actual cost of putting it into the condition in which it is at the time the valuation is to be made. He argued that a developing utility spends money for experiments and that this money is as much a part of the total investment as any that was put into physical property and that those who invested in the utility are as much entitled to return upon the money spent in one way as in the other.

In this connection, he stated that $5,000,000 has been spent by the company during 30 years in experimentation.

H. Finlay French, representing the Protective Telephone Association, in his testimony, criticized Mr. Yellott's conduct of the people's case, intimating that in his desire to be abundantly fair he had allowed the people's interest to suffer. He thought that Mr. Yellott should have fought the case from a partisan standpoint, instead of using business methods to reach agreement as to values with representatives of the company.

Mr. French said the company is earning from 11 per cent. to 12½ per cent. in Baltimore city. This was figured in the following way:

Fair value of company's property in Baltimore city, $5,300,000.

Profits in Baltimore city, $670,028.

A 6 per cent. return on $5,300,000 would give earnings of $318,000. This is less than half of the return as quoted. An 8 per cent. return would give only $424,000, or $246,028 less than the quoted returns. It would take a 12½ per cent. return to bring the figure up to $670,028.

On the 11 per cent. basis Mr. French takes the company's own valuation of property and own report of net returns. The book value of the property in Baltimore city is given as $5,837,644, the actual return as $639,194. A 6 per cent. return on the book value would be $352,419, or $286,775 less than the actual return. The latter is practically 11 per cent.

Petition to Allow " Sleeping Hours" Denied.

The Industrial Board of the Department of Labor and Industry has disallowed a petition from the Eastern and Western Independent telephone associations of Pennsylvania, asking that hours of women operators between 11:30 at night and 5:30 in the morning be known as "sleeping hours" in exchanges where not more than six calls are made during that period. The associations stated in their petition that comfortable sleeping quarters would be provided women operators in the telephone exchanges where continuous service is furnished but where the average number of calls between the hours designated does not exceed six, they requested that such "sleeping hours" should not be considered a part of the hours of labor. In refusing to grant the petition the Industrial Board declared:

"A change in these particulars in the interpretation of the woman's labor act is not of general necessity to the telephone companies of the state employing operators in similar night work and performing similar service to the community. The woman's labor act was enacted for the benefit of women in industry; therefore, any change in its interpretation must be clearly shown to be at least no detriment to the women affected. An inquiry among the telephone operators affected would indicate that the change as requested would be, as far as now can be ascertained, to their detriment."

Referendum on Spokane Franchise Held Valid.

In a decision handed down October 18 by the supreme court of Washington the referendum filed against the franchise granted the Pacific Telephone & Telegraph Co. is held valid, and the franchise ordered submitted to popular vote at the coming city election. F. J. Walker, a Spokane real estate dealer and property owner, contested the legality of the referendum, contending that the statute relating to telephone franchises vested the power to make such grants exclusively in the legislative authorities of the city and that the action of the council in passing the franchise was final.

Judge Sullivan, in the superior court, held that the right of referendum existed, and tihs position is upheld by the supreme court. The court rules that a telephone franchise is granted by the city as a "corporate entity" and not by the city legislative authorities, and that, therefor, the city charter provision as to a referendum is applicable.

To Regulate Construction Over Railroad Rights-of-Way.

The Kansas City Southern Railway Co. recently filed with the Missouri Public Service Commission a formal application asking that the commission adopt uniform rules and regulations governing the construction and maintenance of poles, wires, cables, signal and other circuits of similar character of telephone, telegraph and railroad companies over the rights-of-way, tracks and lines of wires of railroad corporations in the state of Missouri.

The commission has designated this as Case No. 796, and has notified all telephone, telegraph and railroad companies doing business in the state to be present at a hearing which will be held at its office in Jefferson City, Mo., on December 1, 1915, at 9 a. m.; that telephone, telegraph and railroad companies are hereby made parties defendant and that they are respectfully requested to file with the commission on or before December 1, any proposed tentative rules and regulations aforesaid or any suggestions respecting the terms thereof; that the commission, after hearing will adopt by general order uniform rules and regulations in the premises.

Portland Club to Support Movement for Interconnection.

Protesting against the duplication of telephone service in Portland, Ore., and stating that the practicability of interchange service has been proved, the Laurelhurst Club recently adopted a resolution pledging support to the effort to secure connections between the Pacific Telephone & Telegraph Co. and the Home Telephone & Telegraph Co., of Portland, so that communication may be possible over the lines of the two companies by the patrons of either.

A copy of the resolution was ordered sent to the public service commission at Salem, so that body might be advised of the club's protest and of the need for granting the order asked for in a complaint now pending before the commission.

To Restrain Construction of Telephone System by Postal.

The Cincinnati & Suburban Bell Telephone Co. has filed a petition with the Ohio Public Utilities Commission asking that the Ohio Postal Telegraph-Cable Co. be prohibited from constructing a telephone system in Butler county. The Cincinnati company operates in this territory and alleges that it is capable of taking care of all business.

The Cincinnati company asserts that the Postal company is not authorized to do telephone business in the state and that there has been no public demand for additional service in Butler county. The Postal company has been given until November 1 to file its answer.

To Restrict Use of Unlimited Service Telephone.

The Chesapeake & Potomac Telephone Co. has made formal application to the Public Utilities Commission of the District of Columbia for permission to have unlimited service restricted to the use of the subscriber to such service and his agents. A hearing has been set for November 1, at which time interested parties will be permitted to present their side of the case.

Controversy Over Toll Lines in Indiana Settled.

Commissioner Charles A. Edwards of the Indiana Public Service Commission recently settled a long standing dispute between the South Bend Home Telephone Co. and the Home Telephone Co., of Rochester, Ind. The question was over ownership of lines from Argos, through Fulton county to the north boundary of Cass county. The Rochester company, it was decided, owned the lines, and $1,750 was awarded to the Rochester company because of various messages and press association contracts that had been kept by the South Bend company.

Summary of State Commission Hearings and Rulings.

CALIFORNIA.

October 25: Hearing on investigation into the rates of the Pacific Telephone & Telegraph Co. covering the entire state. A complaint was recently filed with the commission by the city and county of San Francisco. Subsequently the company asked the commission to conduct an investigation and fix rates for its entire system within the state, alleging that it would not be fair to consider rates for one exchange separate from its system.

DISTRICT OF COLUMBIA.

November 1: Hearing on application of the Chesapeake & Potomac Telephone Co. to have telephone service restricted to the subscriber and the agents and representatives of the subscriber.

ILLINOIS.

October 26: At the hearing on application of the DeKalb County Telephone Co. for an increase in residence rates at DeKalb and an increase in business rates in Sycamore, objections of the cities of DeKalb and Sycamore were heard. Another hearing in the matter will be held November 9, at which time it is expected that definite action will be taken by the commission.

KANSAS.

October 15: The commission dismissed the complaint of the Baxter Telephone Co., of Baxter Springs, Kan., against the Cherokee County Mutual Telephone Association. The complaint was dismissed on application of the complainant, an agreement having been reached between the two parties to the controversy.

November 10: Hearing at Emporia, Kan., on the case of the Reading Mutual Telephone Co., vs. the Emporia Telephone Co. and W. W. Finney, president, in regard to service. Docket No. 945.

November 10: Hearing at Emporia, Kan., on the case of the Emporia Telephone Co. vs. the Reading Mutual Telephone Co. Docket No. 985.

November 10: Hearing at Emporia, Kan., on application of the Emporia Telephone Co. for permission to increase rates on desk sets. Docket No. 1116.

MARYLAND.

October 20 and 21: Hearing on investigation of the Chesapeake & Potomac Telephone Co. in the state of Maryland, in regard to rates.

MISSOURI.

December 1: Hearing on application filed by the Kansas City Southern Railway asking that the commission adopt uniform rules and regulations governing the construction and maintenance of poles, wires, cables, signal and other circuits of similar character of telephone, telegraph and railroad companies over the rights-of-way, tracks and lines of wires of railroad corporations in the state. The commission has notified all telephone, telegraph and railroad companies in the state to be represented at the hearing; that they are made parties defendant; and that they are requested to file with the commission any proposed tentative rules and regulations or suggestions relative to the terms of the proposed rules; that the commission, after a hearing, will adopt by general order uniform rules and regulations. Case No. 796.

NEBRASKA.

October 21: Hearing on application of the Hamilton County Farmers Telephone Association, of Aurora, Neb., for an increase in rates at some of its exchanges and also to revise rural rates and limit its city service at Aurora to a distance one-half mile beyond the city limits. It is now giving city service a distance of three miles outside of the city.

NEW YORK.

October 22: Hearing on complaint of Frank M. Bradley, of Barker, N. Y., individually and as representing the West Somerest Cold Storage Co. against the New York Telephone Co., as to rates.

October 26: Hearing on complaint of the city of Cohoes, village of Waterford, city of Watervliet and others against New York Telephone Co. and American Telephone & Telegraph Co., as to rates.

October 29: Hearing on complaints of the board of trade of the village of Malone, subscribers on Chateaugay and Burke exchanges, and St. Lawrence County Pomona Grange against the Mountain Home Telephone Co., Adirondack Home Telephone Co. and New York Telephone Co., as to rates and service.

OHIO.

October: Petition filed by the Cincinnati & Suburban Bell Telephone Co. asking that the Ohio Postal Telegraph-Cable Co. be restrained from constructing a telephone system in Butler county. The Bell company asserts the Postal company is not authorized to do telephone business in the state and that there has been no demand for additional service in Butler county.

OKLAHOMA.

October: Hearing on the case of the Geary Telephone Co., of Geary, Okla., vs. the Watonga Independent Telephone Co., of Watonga, and the Pioneer Telephone & Telegraph Co. relative to physical connection.

October 19: Petition filed by a number of patrons of the Norman Telephone Co., Norman, Okla., protesting against the "out of date telephone system" now maintained in that city. The petition asks the commission to conduct a hearing with the view of ordering the company to install a better and more modern system in Norman.

November 9: Hearing on application of the Union City Telephone Co., of Union, Okla., for an increase in rates. The company now charges $1 and $2, respectively for residence and business service, and wants to advance the rates to $1.50 and $2.50.

OREGON.

October: The Laurelhurst Club of Portland has filed a resolution with the commission, pledging support to an effort to secure connections between the Pacific and Home companies now operating in Portland.

PENNSYLVANIA.

October: The commission has approved the sale of certain property in Bedford county by the Central District Telephone Co., Pittsburgh, to the Chesapeake & Potomac Telephone Co.; the sale of certain poles in Pittsburgh by the Allegheny County Light Co. to the Central District Telephone Co.

VIRGINIA.

November 4: Hearing on application of the Chesapeake & Potomac Telephone Co. for permission to advance its rates on two-party line service at Newport News, Va., from $36 to $42 a year.

WEST VIRGINIA.

October 15: Application filed by the Western Pendleton Telephone Co., to increase its service rates.

WISCONSIN.

October 14: The Cross Plains Electric Co., of Cross Plains, Wis., filed a petition asking that the Black Earth Telephone Co., of Black Earth, be ordered to reconstruct its telephone line between Black Earth and Cross Plains, so as not to be interfered with by a high tension electric wire running between Black Earth and Cross Plains and owned by the Cross Plains Electric Co. This is the first petition filed under chapter 61 of the laws of 1915.

October 19: The commission granted the application of the Barron County Telephone Co., of Barron, Wis., to discontinue magneto local service at its Rice Lake exchange and to furnish only common battery local service.

October 22 and 23: Hearing at Madison, Wis., relative to standards and rules for the regulation of high tension wires. The last legislature gave the commission power over high tension lines and now a general standard of service applicable to all is desired by the commission.

October 25: Hearing at Eleva, Wis., on the case of Albert E. Faast vs. the Shaw Telephone Co. in regard to service. U-830.

October 26: Hearing at Cadott, Wis., on the case of August Cirkel, et al., vs. the Cadott Telephone Exchange, in regard to service. U—832.

October 27: Hearing at Mineral Point, Wis., in the case of the Farmers Independent Telephone Exchange vs. the Mineral Point Telephone Co. in regard to physical connection. U—836.

October 27: Hearing at Mineral Point, Wis., in the case of Harry Collicut, et al., vs. the Dukes Prairie Telephone Co., the Mineral Point Telephone Co. and the Iowa & LaFayette Telephone Co., in regard to violation of law. U—841.

October 28: Hearing at Mineral Point, Wis., in the case of the Mineral Point Telephone Co. vs. the Dukes Prairie Telephone Co., the Mineral Point & Jonesdale Telephone Co. and the Iowa & LaFayette Telephone Co., in regard to violation of law. U—840.

Transatlantic Wireless Telephony Accomplished

Message Received by A. T. & T. Co. Engineers at Eiffel Tower, Paris, from Arlington, Va,—Details of Feat—Experimental Development of Equipment Discussed by John J. Carty, Chief Engineer of A. T. & T. Co.—Operation of Apparatus

John J. Carty, chief engineer of the American Telephone & Telegraph Co., in Chicago, on October 21, received a cablegram from H. E. Shreeve that wireless telephone messages sent out by Bell telephone engineers from the wireless station at Arlington, Va., near Washington, were received at Eiffel Tower in Paris. Satisfactory talk was carried on by means of the apparatus developed under Mr. Carty's direction. B. B. Webb, one of the Bell engineers, spoke and was heard by several French officials and by H. E. Shreeve and A. M. Curtis, the representatives of the American Telephone & Telegraph Co. While tests had succeeded before, no mention was made of the fact out of courtesy to the French government.

The following despatch from New York covers the details of the transmission of speech by wireless telephone between Arlington and Paris:

Transatlantic wireless telephony is an accomplished fact. Observers listening at the Eiffel Tower in Paris have heard speech sent out by engineers of the American Telephone & Telegraph Co., from apparatus developed by that company and the Western Electric Co., and installed at Arlington, Va. The equipment used was that employed a few weeks ago in talking by wireless telephony to San Francisco and Honolulu. The antenna employed at Arlington was that of the United States Navy Department which was placed at the disposal of the American Telephone & Telegraph Co.'s engineers through the courtesy of the department.

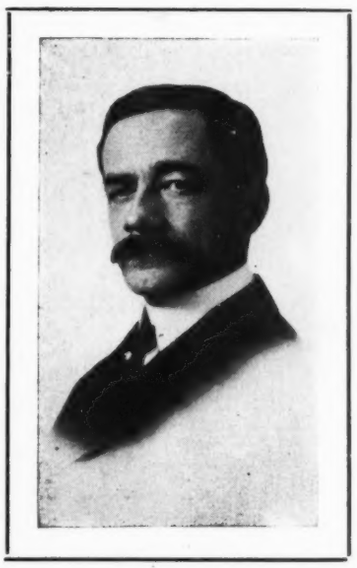
At the time of the announcement of successful wireless telephony from Arlington to Mare Island, Panama, San Diego and Honolulu, September 29, Chief Engineer John J. Carty, of the American Telephone & Telegraph Co., made the announcement that the achievement then accomplished, demonstrated the possibility of transatlantic wireless telephony from Washington or New York to London, Paris and other European capitals. He stated that, were it not for the conditions of war existing in Europe, the accomplishment of transatlantic wireless telephony would undoubtedly have preceded the much more difficult feat of transmission to Honolulu.

The announcement that speech has actually been transmitted from Arlington to observers stationed at the Eiffel Tower, Paris, marks the conclusion of another chapter in the experiments undertaken by the American Telephone & Telegraph Co. When Mr. Carty's engineers commenced work on the long distance wireless telephone experiment, observers with receiving apparatus were sent not only to Panama, San Diego, Mare Island and Honolulu but two engineers, H. E. Shreeve and A. M. Curtis, were also sent to Paris, where, through the courtesy of the French government, which was apprised of the nature of the work to be undertaken, limited facilities for listening at the Eiffel Tower station were placed at their disposal.

Co-operation of French Government.

Full appreciation of the interest and extreme courtesy of the French government can be understood when the great value of the Eiffel Tower station for military purposes is remembered. In fact, the amount of time available for the wireless telephone experiments was so limited as to constitute a serious handicap to a speedy completion of the work. Added to this was the handicap resulting from the fact that all regular communication between Mr. Shreeve and engineers in America had to be by cable and was subject to long delays.

Notwithstanding the difficulties of communication, the limited amount of time available for receiving, and despite heavy interference from high power stations in the neighborhood and from static disturbances, speech was successfully transmitted from Arlington to Paris over a week ago and has been repeated on several occasions since.



John J. Carty.

In a cable received by Mr. Carty concerning the results of tests made early on the morning of October 21, Mr. Shreeve reported speech received by him and the time of its reception. The matter received at Paris was that sent out from Arlington where R. A. Heising, B. B. Webb and other telephone engineers were manipulating the apparatus at the transmitting station. Mr. Webb did the talking throughout the experiments which culminated in the transatlantic telephony.

Simultaneously with the reception at Paris, speech sent out from Arlington was received on the wireless antenna at the Western Electric laboratories at New York and at the temporary station of the American Telephone & Telegraph Co., at the Pearl Harbor Navy Yard, Honolulu. Mr. Espenscheid at Honolulu reported that he heard the conversation throughout the entire schedule and that Mr. Webb's voice was easily recognized.

Mr. Carty, while in Chicago, made the following statement regarding the transmission of speech from the Arlington Tower, across the Atlantic to Paris:

"It is true that we have succeeded in transmitting speech across the Atlantic Ocean from the navy tower at Arlington, Va., to the Eiffel Tower at Paris, using the same apparatus that we have previously employed in talking to Panama, Mare Island and Honolulu. The trial made from Arlington employed the new A. T. & T. wireless system, and was conducted by our engineers, R. A. Heising, B. B. Webb and others of our staff at Arlington, Va., and H. E. Shreeve and A. M. Curtis, two of our engineers, at the Eiffel Tower, at Paris.

In a cable message received from Mr. Shreeve, he reports the successful transmission of speech across the Atlantic. He heard Arlington say "hello" and a number of other words, and he heard Arlington say "good-bye, Shreeve," repeated a number of times.

A most striking feature of these tests is that our engineer at Honolulu distinctly heard his associate, Mr. Webb, at Washington, talking to Mr. Shreeve, at Paris, and he recognized his voice. This I learned from a cable message which I have just received from Mr. Espenschied at Honolulu stating that he plainly heard Mr. Webb at Arlington talking to Mr. Shreeve at Paris, saying "hello,

Shreeve," "this is Webb talking," etc. Mr. Shreeve also reported hearing speech from Arlington on two days during the week of October 11. Ideal conditions, however, were needed to make the trials a success.

Announcement of the success of these experiments was deferred owing to the delays in cabling, and our inability to communicate promptly with the French officials. We are under the greatest obligations to the French officials for their extraordinary courtesy in permitting us to experiment at all at the Eiffel Tower when it is so urgently needed for military purposes. Eiffel Tower is the hub of their communication. A great battle raged in the Champagne, yet the French caused the suspension of all wireless communication, both at the tower and at other wireless stations, to allow our trial of wireless telephony every opportunity for success."

Mr. Carty in speaking of the experimental stages passed through in the development of the achievement, said:

"There have been disputes about the identity of the original discoverer of the possibilities of wireless telephony. Probably Professor Alexander Bell, however, first talked through the air. The science was not developed to any extent for many years.

Ten years ago the American Telephone & Telegraph Co. decided to test the possibilities of wireless telephony. There are approximately 500 eminent scientists in the employ of the company. During the last ten years at least 50 of these men have devoted their time largely to the apparatus needed.

The experiments were conducted for years in laboratories. The Western Electric Co.'s New York laboratories were the scenes of the primary development. Later, part of the burden fell to the laboratories of the company's plant here in Hawthorne.

Secret Apparatus Guarded.

It was decided to keep the development of our apparatus secret. As I said, the achievement was intended for America only, and every means of preventing its being known abroad were taken.

I am not at liberty to describe the apparatus we now employ, because it has not yet been patented. It is true the secrets are in the hands of the American naval authorities, who have co-operated with us in every phase of the work.

We had to develop the sending and receiving apparatus to an efficient point without a demonstration. That was necessary, because as soon as one begins talking through the air, the whole world is apt to hear of the exploit.

The same wire from which wireless telegraph communications are sent out, is the wire that sends into the air electrical waves from wireless telephone apparatus. All we had to do then, was to send out a message by wireless telephony. It was received at the wireless station by wireless telephone receiving apparatus, which was then disconnected, and wireless telegraph communication immediately established to tell us of our success."

How Messages are Sent.

"How would a message be sent by your wireless telephone apparatus?" Mr. Carty was asked.

"There is a common telephone at the base of the wireless tower," he explained. "You enter the building where it is housed and take off the receiver, placing it to your ear. The current that flows through the wire from this telephone has little power. It is not severe enough to more than cause your tongue to tingle, providing power of that strength were applied to your tongue.

Electrical waves caused by the sound of the voice, as they pass along this wire, reach an electrical apparatus, which is one of the keys to the invention. This weak current is so developed as it passes on and upward, that when it runs out along a high tension wire and is shot into the air in the form of electrical waves, the voltage would kill a man. This is accomplished by an electrical generator of between 50 and 75 horsepower—in other words, this apparatus which develops electrical currents that will pass around the globe, develops the same horsepower of the average automobile driven by a business man.

Waves Reach Everywhere.

The waves are sent out in all directions, and not in a straight line. They reach everywhere. One does not need to know where a ship at sea may be, to get into communication with her.

Messages are received like any ordinary telephone calls. The currents come in contact with a delicate receiving apparatus at the receiving station and are carried into an ordinary telephone receiver."

Pole Lines to Aid in Fighting Michigan Forest Fires.

The telephone pole lines in Michigan are to play a prominent part in the location and extinguishing of forest fires in the Wolverine state, without expense to the companies. Under the plan, originated by Chief Warden W. J. Pierson, the telephone and telegraph poles along railroad rights-of-way are to be numbered consecutively. Engineers of trains traveling through districts where there is danger of fire will be supplied with cards. Upon discovery of a fire the engineer will be instructed to mark the number of the pole nearest the blaze and throw the numbered card from his cab window to the first section guard he passes.

The section crew, with its car, will then be ready to render prompt service in extinguishing the fire. At present an engineer is required to report a fire at the next stop, and often much valuable time is wasted before the section crew can be located and dispatched to the scene. The plan has found favor with State Game and Fire Warden William R Oates, and it will probably be put into effect.

Photographic History of Telephone Operating.

The traffic department of the Chicago Telephone Co. has devised a unique means of giving the public a graphic and detailed understanding of the various steps in the operator's vocation. Three groups of transparent photographs, illuminated by an electric lighting arrangement from behind, which tell the story of "An Operator's Day," the "Telephone School" and the "Path of a Telephone Call," are being exhibited in the Chicago department stores.

They are telling their stories to throngs of department store customers, who pause for a moment to catch a glimpse of the life of the telephone operator. Each of the transparencies consists of 15 photographs, the first one showing the operators at work at the switchboard, the operators' rest-room, the operators at lunch, etc. The second transparency shows the methods used in training students to become efficient operators before being assigned to regular positions serving the public, while the third one traces the path of a telephone call, from the time the calling party gives her number until she is connected with the called subscriber.

Telephone Extensions in Norway.

Considerable extensions have been made in Norway to the telephone service. Toll lines have been extended to Narvic, in the Arctic Circle, communicating with the Lofoten and Vesteraalen Islands. In addition to several new lines, a telephone line is being built via Lillehammer to Geiranger, Walesund. A committee is considering the question of installing a new telephone exchange at Christiania, and has recommended the construction of a main exchange with four local exchanges and a gradual transition to the automatic system. The percentage of telephone subscribers to population in Christiana is one telephone to every 12 persons.

Co-operation of Utilities With the Public in General

Difficulties Encountered in Pole Line Construction Due to Interference from Trees—Regulation of Species of Trees Along Highways—State Control Advocated—Paper Presented at Convention of Independent Telephone Association of America

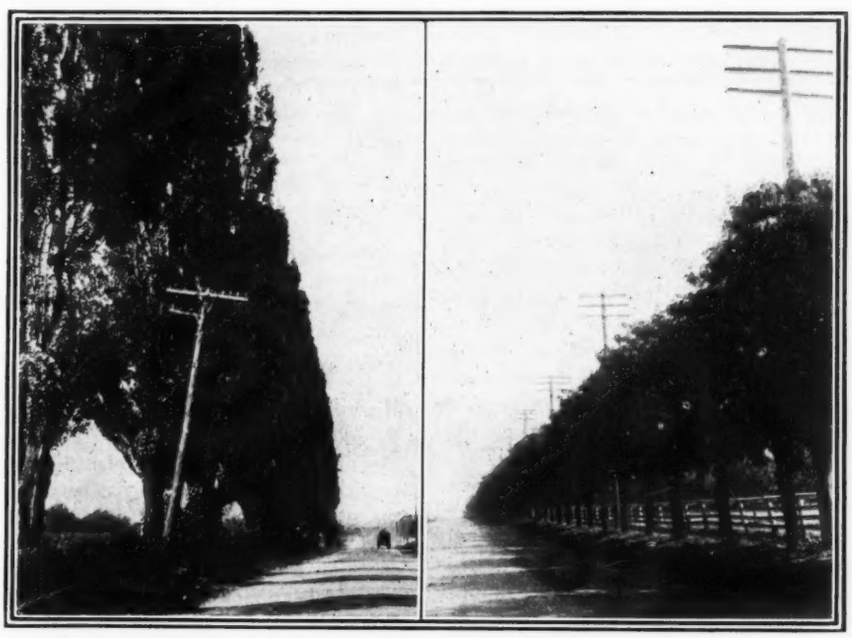
By A. Wardman

The subject assigned for this paper was "Necessity for Co-operation," but it has been enlarged so the discussion will be on a topic that is in my estimation very important, namely: "Co-operation of Our Public Utilities With the Various County and City Officials and the Public in General, With Reference to the Planting and Care of Trees on Public Highways."

This discussion, in itself, will apply to conditions in Southern California, with which I am more or less familiar, and in general to the entire United States.

It is not the intention of the writer to criticize, or in any way find fault with the officials having the regulation and planting of trees under their charge, as we have always found them ready and willing to extend any courtesy possible. But through the lack of a definite understanding, we have no basis upon which to plan our construction, and the average telephone man is in a hard predicament when he undertakes to plan the construction of a pole line upon the average highway.

Quite frequently he has in his possession a permit, issued from the road department or the city street superintendent, which presumably is to give him the right to construct a pole line. In the planning of his work he will probably interview the city tree warden, forester, or whatever title this official may have in that particular community, be informed that the place where the road foreman wishes the poles to be set will cause interference with trees and will suggest some other location, which is impractical with the rest of the plans as laid out by the road foreman and himself.



Contrast In Appearance of Highways with Tall Trees and with Low Ones.

My main thought in agitating education along the lines of which I am going to speak, is to have co-operation between all parties interested in construction work of this nature in order to increase the efficiency of the service rendered.

Not many years ago, the telephone man preaching the gospel of efficient service was regarded with a good deal of pity and those enunciating such doctrines were not considered capable of being trusted with practical business affairs. But now, the need for such procedure is universally recognized by the heads of all telephone companies, as well as those of other public utilities. The utility and the community are mutually interested in the cost of rendering efficient public service. Any increase in the cost of such service, where there is no possibility of effecting future economies, as in the case of trees, is more harmful to the consumers than to the utility. Thus, the interest of the utility is a serious interest for the community. What harms one hurts the other, and increases the cost of production for both of them.

For these reasons it would seem that a campaign of education should be started throughout the entire nation, through our trade journals and otherwise, educating the people to these facts and calling attention to the serious results of the lack of co-operation. These matters will undoubtedly require the thoughts of men who understand human nature, who know how to lead, and who are broad enough to co-operate with their competitors and all others interested in a campaign of education, in order that the public will realize that unreasonable hardships imposed upon public utilities, in the long run, will seriously affect their own convenience and pocketbook.

The average property owner, under existing conditions, seems to be of the opinion that his particular tree should not be trimmed or removed. The tree warden or forester is of the opinion that owners of the most valuable trees are hardest to contend with and that it would be out of the question to issue a permit for the removal of a limb under any conditions. The old familiar argument, so frequently used, and which the average telephone man dreads is, "Why not put the wires underground

or string cable?" The telephone man, who is endeavoring to keep in good condition the present well constructed lead and tries to explain the impracticability of such a course, has very little doubt left in his mind what the questioner thinks of his argument.

Have any of you ever attempted to convince the average layman that it was impractical to operate a commercial telephone line where 25 or more miles of cable were in the circuit? That the cost of installing cable for a few subscribers in local service did not return interest on the investment at the rates charged? Or have you tried to convince him that you could not build on another road and cut down his neighbor's trees instead of interfering with his particular tree, which his great-grandfather raised from the seed. If any have accomplished this, I would be pleased to meet them and, if possible, find out what method was used.

The Remedy.

It has been my opinion for years that a tree, which at its maturity will not exceed 30 or 35 feet, will give sufficient shade upon any highway and be less expensive to maintain from a pruning standpoint. It also creates safer conditions, which will be considered later. If these conditions were created, then the construction man could figure the height of poles running from 35 to 45 or 50 feet, where tree conditions exist. He would know that by so doing he would be in the clear for the natural life of the line which he was constructing. To some the cost of a higher pole may appear rather expensive, but I think you will agree with me that in the long run, the saving in cost of maintenance will more than offset the extra cost in construction, in addition to the satisfaction of better service which you will be able to render.

Dealing with the planting and care of roadside trees, every section of country has its different varieties, and a number of these are of a revenue-producing nature. And while it would not be necessary for the particular purpose to which I am referring at this time, still it might be wise to consider from a serious standpoint the advisability, so far as possible, of planting revenue-producing trees, which in their particular section of country would apply in the same manner that the citrus and other trees apply to Southern California.

Plans for the planting along many of the country highways of fruit-bearing trees, are being discussed throughout Southern California, and the thought is one of the main ones before civic bodies, city and county foresters and tree and scenic beauty enthusiasts. "How the practice of planting trees for revenue in most parts of Southern California can be accomplished without the sacrifice of ornamentation," is one of the many interesting questions for discussion and contains a thought which should soon receive universal attention by all officials having charge of the planting of trees upon the public highways.

The chief problem at present is the variety of trees to select. Deciduous trees are favored by many as they shed their leaves during the winter season. The result is that during the rains the ground underneath is dry, while with trees like the cedar, the ground underneath is wet and automobile accidents are a possible result. Undoubtedly many of you, in traveling a road in the morning after a foggy night, have run into the treacherous and slippery pavement which was otherwise dry, extending across the highway where tall trees are located. The shorter tree does not create this condition as a rule.

Looking at the matter from the property owner's standpoint, he has very little use of his land for some distance from the highway, where trees of greater height are maintained, whereas with the shorter trees he can utilize his land to the best advantage.

The annual up-keep of many of the shade trees being planted at present proves an item of no mean importance in city and county budgets and appropriations. Pruning alone, if properly done, with some of the quicker growing varieties becomes a very serious problem, after the trees reach a large size.

So far as the initial cost, from planting to maturity, is concerned, it will cost little, if any more, to grow a profitable shade tree than it does to grow many of the non-productive trees now growing and in the course of planting. Therefore, I argue that the farmer has better use of his land with a shorter tree—vehicles upon the public highways are in less danger, and accidents less liable to happen. If a fruit-bearing tree is planted, the property owner will have the additional advantage of the crops.

To the argument advanced that the people would steal the crops, it appears that the answer would be that miles and miles of orange, walnut and other productive trees now face upon the highways and are not seriously interfered with. And even should more or less of the crops be taken by the people, surely it is better to have a tree that will help someone in need than to have a non-productive tree, whereby no person is benefited:

In many parts of the world, and especially in France, it has been found that the plans for beautification and shade go hand in hand with profit. What can be done elsewhere is possible in the United States.

Interrupted Service.

The public being supplied with telephone and other public utility service, particularly need the uninterrupted operating of their lines in times of trouble, such as storms, floods and other conditions. Their service in a large percentage of cases is useless, under these conditions, which is often caused by lack of co-operation of the public with the companies rendering the service. In normal times there is more or less interference with the service by grounds, broken limbs, and a continual crossing of lines caused by the tree swinging against the wires during slight winds. Invariably the subscribers have to suffer by this interference with the service, which is very irritating to them, especially in cases of sickness, etc. Then again there is the constant danger to life and property, caused by the wires entering building, becoming crossed with other lines carrying high voltage.

The Relief Suggested.

Most of the states at the present time have a railroad commission or other body having jurisdiction over the class of service rendered by public utilities, the efficiency of the service, the rates charged, methods of construction, etc. If, for any reason, a company is rendering unsatisfactory service, the railroad commission has the power to order necessary changes, in order to render efficient service. I argue that they should also have the right to protect a public utility from the impossible conditions created by and through the unreasonable burdens placed upon the rendering of such service by tree interference where it is necessary to maintain the apparatus of such utility.

With this fact in view, a number of public utilities in Southern California have discussed the advisability of asking our state legislators to pass laws giving the right to the Railroad Commission of California to grant relief where satisfactory arrangements cannot be made with the local authorities. In this way a public utility would have the right of appeal to the railroad commission and the commission could then issue an order granting permission to trim trees or to remove them where it was not practical for the public utility to overcome the difficulty in some other reasonable manner. And I take this opportunity to suggest to you that, in my opinion, a law

of this sort would prove of untold advantage to all corporations operating public utilities as well as to the public in general.

If such a law as this existed, the various tree wardens and forestry departments of the cities and counties, dealing with the planting and care of roadside trees, would then co-operate with the railroad commission and public utilities in the planting and care of the thousands of trees now planted and to be planted in the years to come.

The result would be that in the course of time there would be a true and even line of trees upon the public highways, the public utility poles being set in line between the trees with sufficient clearance over them. Surely this would look a great deal better to the beauty enthusiasts than the present condition of trees of all heights and shapes, with a big notch cut out of the side of one and through the heart of the next, a line of poles setting two or three feet out of line, probably leaning in all directions with side-arms upon some of them, extensions upon others and a general "mess of wires" hanging in every shape imaginable.

Let us become boosters for the tree beautiful; co-operate with those having these matters in charge, helping them to see the advantages of the suggestions as made in this paper, and at the same time relieve ourselves and the public of the present inefficient method of rendering service and substitute therefor a more efficient and economical service.

Practical Subjects—Letters and Discussions

Block Assigning System for New Subscribers.

Not very many years ago when an order was received for a new installation, the line foreman and his crew went to the new subscriber's premises, and, after looking the situation over, detemined whether the new subscriber could be connected with someone else in the neighborhood or whether a new circuit was necessary. From the time this crude system was in effect up to the present day, many improvements have been made in assigning methods.

In a recent issue of the Bell Telephone News, L. P. Williamson describes the block assigning system which is used by several of the Bell companies. The quickest and most simple method of explaining the system will be to follow the routine of assigning one order, and by reference to the accompanying diagram a general idea of the scheme will be obtained.

An order is received for two-party service at 1809 East Eighty-eighth street. First the person in charge of the assigning department turns to a catalog of five-by-eight-inch cards and in numerical order he finds a card marked East Eight-eighth 17-18-19. This marking indicates that street numbers 17, 18 and 19 hundred on East Eighty-eighth street are shown on this card, and, on removing the card he finds a diagram of the block as shown in the accompanying illustration.

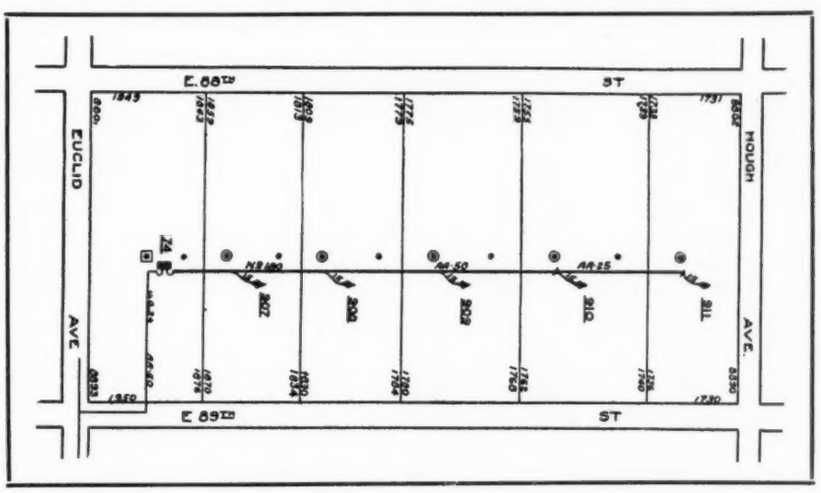


Diagram Showing Block Assigning System.

It is seen at a glance that 1809 East Eighty-eighth street is fed by terminal number 908, aerial cable number 180. Turning to cable chart 180 the record shows that 5000-J, a two-party line, is working out of terminal 909 and that the same conductors multiple into terminal 908, out of which the new station must work. Now he must find out if 5000-W is available.

Directly back of the diagram or index card in the catalog is a green card showing all the two-party lines in the block, arranged numerically by telephone numbers and showing the street addresses. There are also other colored cards representing every other class of service. On this assignment, however, he is only interested in the green or two-party line card.

This card shows us that 5000-W is available. This number is therefore assigned, the address entered on the green card, assignment entered on the order and recorded on the cable chart. The order is then sent to the installation department for execution.

The system of naming and numbering streets in the city of Cleveland, Ohio, is ideal in connection with working out this plan. However, in municipalities where the numbering and naming of streets has not reached the perfection of the Cleveland system, this same method of assigning may be followed by assigning a number to each block and showing that block number on a key map, which can be kept on the assigning clerk's desk under a glass top. This method is followed in connection with assigning orders in the suburban municipalities surrounding Cleveland, where the street numbers are arranged in a rather haphazard manner.

The secret of successful assigning is good records, and the more simple the records the greater the accuracy. The block assigning system greatly simplifies the records, and, therefore, increases the accuracy of assignments.

This system also increases the speed of assigning, and where it was possible under the former method for one clerk to assign at the most 20 orders per day, it is now possible to assign anywhere from 40 to 50 orders per day. Due to the fact that the records allow the assigning of new stations in such a manner that the subscriber will work from the nearest terminal box, a large saving wire has resulted.

Efficiency Methods.

I have been studying, this year, a course in efficiency and have started practical applications of it. As everyone knows, one of the elementary principles is standardization of conditions, methods, operations, etc.

What I am trying to get to is this: Would it be feasible to conduct an efficiency department for the exchange of information of this kind among the smaller companies? The big companies make a study of conditions and methods applicable to their conditions, but, except in isolated instances, I have seen nothing for the small operator. Specifications are but a small part of the field. The ground covered would range

from the right kind of screwdriver for a certain purpose, or the right method of placing a cross arm to the control of the property as a whole. Nearly everyone has some idea (I do not mean "pet stunts") that he knows to be the most efficient for certain circumstances.

I have not got down to fundamentals myself, but will give an illustration of what I have done, for example, in clearing trouble on country lines. The line is tested from the switchboard or distributing frame with a low resistance (I use a 500-ohm) voltmeter. If the line is crossed or grounded, an estimate is made of the location when reliable readings are obtained. The troubleman then assembles his Stewart test set, repair tools, and drives his team or car to a pole near a point where the results of the test, combined with his judgment of conditions on the line from record and experience, indicate it may be. If the line branches, the junction pole nearest the supposed location is used, and a direction test is made, which nearly always leads him directly to the trouble.

The Stewart test set is, under our conditions, a necessity for economic working. In the first place, we have no "test poles" but all wires are run straight through, or if bridling is necessary, soldered (by our standard method). For this reason we can, with the capabilities of this test set, make our test for location at the most economical point, eliminating almost all "following the line."

This may not be the right method, but it is what I have judged to be so. If it, or some other method, were judged by the editor to be the best method for general conditions it would be published in such a department, subject to criticism by the field at large. Or, if possible, the department might be conducted by an engineer of sufficiently broad experience to make him an authority.

I have mentioned plant construction and maintenance only, as traffic and accounting have been pretty well standardized.

I am not an authortiy in any branch, but would co-operate to the best of my ability if such a plan were carried out.

Collinsville, Conn. Percy R. Savage.

[Editor's note: If there are others among our readers who are interested in the subject of efficiency as set forth by Mr. Savage, TELEPHONY will be glad to inaugurate such a department for the exchange of ideas. In order to make such a department a success, however, the readers would have to support it, so that all may obtain the greatest benefit from it.]

The Telephone, Great Aid in Loading Grain Boats.

The Girard Point grain elevator at Girard Point (near Philadelphia, Pa.,) which is said to be the largest of its kind in the world, is the only one to have its operation controlled by a telephone system, says The Telephone News.

Four traveling belts cover the entire great length of the bridge, enabling the operators to load ships from both sides of the bridge at the same time. At the base of the bridge is stationed the man who controls the movement of the belts. He is supplied with telephones which put him in instant communication with any part of the system. The belt attendant on the bridge and the watchman who stays on the pier near the boats that are loading, are provided with hand telephones, attached to which are cords and plugs. Desk-set boxes equipped with jacks and special gongs are placed at regular intervals on the bridge and pier.

The man who controls the belts can summon either of these men to the station where he wants them by pressing the button corresponding to that station which rings the gongs at that desk telephone. The man summoned inserts his plug in the jack at that telephone and receives his instructions. If he wishes to call the man in charge of the belts, he inserts his plug in any of the desk telephones and turns the generator crank which places him in instant communication with his chief.

All parties involved in the handling of the grain are thus placed in close and immediate touch with one another, providing a most flexible system of handling the loading of these large grain boats which otherwise, considering the size of the elevator, bridge and pier, would be a most cumbersome and unwieldly operation.

Earth Resistivity.

Oil in sand or earth causes it to have a very high resistance to the flow of an electrical current; that is, speaking technically, to have a very high resistivity. Certain valuable ores in the earth cause it to have a very low resistivity. For any particular specimen of earth the resistivity varies with the moisture content. The damage to pipe systems on account of electrolysis by the return current of street railway systems depends among other things upon the resistivity of the earth around the pipes and near the tracks. There are therefore many reasons why we may wish to know the resistivity of certain very limited portions of the earth.

In a recent publication of the Bureau of Standards, Department of Commerce, a method for measuring earth resistivity, which is free from some of the faults of methods which have previously been used, is described. The method is particularly adapted to those cases in which it is important that the measurement be made without disturbing the earth, as is necessary where a sample is taken into the laboratory for measurement, and in those cases where we wish to measure resistivity of a fairly large portion of earth, extending to a considerable depth.

To those interested a copy of the paper, Scientific Paper No. 258, will be sent on request addressed to the Director, Bureau of Standards, Washington, D. C.

A Peculiar Case of Trouble.

I am sending an account of a peculiar case of trouble, which may interest telephone men. Having had my attention called to the failure of several telephone men to find a case of trouble, I looked over the line and reported the circumstances. A broker was bridged on an iron toll line to give markets readily without disturbing the operator. He also had a regular telegraph loop in his office. At times, when he was giving the markets, the telegraph would repeat on the telephone line, and the noise would be quite a disturbing factor. The battery from the telegraph would also energize a lock-up relay in one office and the operator would constantly complain of it.

I found that when the broker had his receiver on the hook the trouble disappeared. In looking for the trouble I found the telephone battery in the same box with the gravity battery of the telegraph sounder, and as the gravity cells were salted and wet, the dry cells had absorbed a great deal of the moisture, and as a result all were in circuit. A little change of location of the dry cells eliminated the trouble for all time.

Aberdeen, S. D. R. H. Perry.

Telephones Warn Autos on Dangerous Grades.

New uses of the telephone are constantly developed, according to a recent issue of the Pacific Telephone Magazine, and its position in the life of the community is strengthened as time goes on. The latest comes from Oregon where, at the top of a steep grade on a road near Hood river, a telephone has been installed for the convenience of traffic. Telephones have been placed at the bottom of the grade on each side. Motorists approaching the hill, telephone to the summit, from which point they are advised by the watchman on duty as to whether or not the road is clear.

Previous to this arrangement there were many tie-ups, necessitating the backing of heavy cars on dangerous grades. This situation is now remedied, greatly to the satisfaction of the traveling public.

Passing October

More of Central Union—Other Matters

By J. C. Kelsey

"Oh, that I had one to hear me. Behold my desire is that the Almighty would answer me, and that mine adversary had written a book."

It goes without saying that this quotation came from Job, that boil-stricken Israelite of early days. The record is not clear that he was bothered with lawsuits, yet this verse seems to indicate that he had reason for attacking the testimony of his enemies.

The great legal battle for control of Central Union is on. It goes on with unabated fury and it is not safe to say that war alone has made progress.

As you know, war has made new use of aeroplanes, submarines, gas bombs, liquid fire, and has enlarged the capacity of every death dealing device. Likewise, a modern lawsuit, involving a great technical property, makes usage of every weapon of legal warfare possible.

I could not help but think of the passage previously quoted as the Bell attorneys carefully approached the various witnesses for the minority with elegantly bound copies of TELEPHONY in their hands.

Every article written by these men on any topic that interests telephone men was carefully marked. Every statement of the witnesses was made to undergo comparison with something that each man had written at one time or other for the benefit of the business.

It reminded me that the only real complimentary-to-Bell article I had ever written was thrown up to me in a great rate case.

So it seems that Job really forcasted one of the principal means of warfare for Bell attorneys—"My desire is that mine adversary had written a book."

Another thing came up which causes one to suspect that Job did not anticipate everything. He should have written "and that mine adversary had given the Bell factory an order." For in cross examination of one of the experts, a well known Independent telephone man, the Bell attorney flashed upon him an order which he had given the Bell factory.

I thought this act was just a little bit unethical, although a recent experience in Arkansas shows that no Independent telephone man can tell what future troubles such an order will cause him.

The lesson is plain: You should give your orders to a house which will not give aid to your natural enemies.

The testimony in behalf of the minority has been completed. An adjournment has been taken for practically one week in order that the Bell attorneys may catch up in their sleep and have time to study a well ordered attack on their position.

The testimony ranged from the cost of originating a message for American Telephone through the 4½ per cent. gross earnings charge, the 100-mile contract and the exclusive Western Electric contract.

In other words, the disordered condition of the Central Union seems to be a story of too much contract.

Independent telephone men are not interested greatly in that 4½ per cent. contract.

It seems that when the fundamental telephone patents expired, the parent company had no further right to charge royalty. So they made a new contract, and for the rental of transmitters, receivers and induction coils, they substituted a charge of 4½ per cent, of the gross earnings.

The great question in the mind of the telephone man is whether he would rather buy his transmission devices outright or rent them at a cost of 4½ per cent. of his gross earnings. No free agent has ever accepted the proposition.

The question in Central Union is not one of choice at all, as the parent company which rents telephones also holds a majority of the stock.

The 100-mile contract seems to be one peculiar to Ohio. Indiana and Illinois alone. It seems that the Central Union company cannot haul a message between its own points, 100 miles apart, even if it has its own lines. It seems strange to telephone men that Central Union at Columbus cannot talk to Central Union at Indianapolis over Central Union lines.

It is well known that Bell licensees must talk to neighboring licensees over American Telephone lines, but when it comes to limiting a company to operate in its own field, there is cause for conjecture.

An interesting bit of information was brought out from a Bell circular which went on to say that $3,500,000 a year could be saved if American Telephone and local licensee lines could be combined. If you have one line, you can't do as well as you can on more lines.

The following table shows how many more calls you can get out of one line if they are grouped:

1 line 20 messages per day.
2 lines 24 messages per day each.
3 lines 28 messages per day each.
4 lines 30 messages per day each.
5 lines 32 messages per day each.
6 lines 34 messages per day each.

This is interesting information even if not generally useful to the telephone man who controls the local field, and allows others to take his long distance business.

The Western Electric testimony was interesting, particularly to the manufacturer. There was a statement which showed losses on switchboard sales to Independent telephone companies.

Of course we know it gave great pleasure to sell these switchboards but it goes to show that the present exclusive relation with the Bell company gives the Bell factory a chance to cut throats of competitors where it pleases, even if it shows loss.

The following typical switchboard sales show losses:

	Sale price.	Cost price.
Sidney, Ohio	$9,362	$9,920
Geneva, Ohio	3,300	3,500
Middletown, N. Y	18,510	19,695
Chicago Junction, Ohio	3,933	4,932

Every one of these contracts was bitterly contested by Independent telephone manufacturers who find profit necessary to their existence.

For all the years since 1907, the year of the opening of the Bell factory to all trade, the sale of switchboards has been surprisingly small. So small is the list, and the amount of the

sales as well, that it seems incredible. Yet sworn testimony reveals the fact.

We have all unconsciously exaggerated this evil of Bell sales, but at no time has any one exaggerated the amount of gossip or controverted news this organization has scattered among the trade.

If the direct effort of the Bell factory was to sell goods at a profit, and not to act as watchman for the Bell telephone interests, not a soul could question its rights.

Again I want to repeat that the information of the Central Union difficulties is not published for malicious purposes.

Every telephone man in this country has the right to know just how far the sheer power of money has carried the telephone business. We have seen money poured into the territory by the millions which, according to the training of our youth, could not help but ruin every one in the path of this flood of money. The experience of Central Union teaches that there is much else in the telephone business besides brute financial force.

It is the hope of this column that the day will soon approach when it will be generally recognized that Independent telephony is a part and parcel of the legitimate telephone business.

In a great many states, every bit of telephone legislation must be fought for or against by the Independent telephone companies. Our problems and Bell problems are exactly alike, and no reason exists why telephone men cannot stand shoulder to shoulder unless it is a feeling that some one will shoot from behind.

No one can object to the Bell factory if it is its sole province to sell goods at a fair profit. No one can object to the officials of the Bell company doing as they please, but as long as it seems that opinions and not results govern, the protest of this column will never cease.

"Behold my desire is that mine adversary had written a book." Readers of this quiet little wish of Job cannot realize the troubles of men who write. Not only does it get one into trouble when he sits in the witness box, but it makes enemies for him in unknown places.

I had thought I was an American, not a hyphenated American of any kind, yet I am accused by some people in England of being a German sympathizer as well as being given to light-hearted and flippant reference to serious things.

My readers can see for themselves that writing a book or a story would give the author a cell in the grim London Tower and possibly a hangman's knot. Dangerous indeed is the lot of the adversary who has written a book!

In May, while the world was writhing in horror over the sinking of the Lusitania, I tried to draw a lesson that mere size did not avail when the crisis came.

That thought has ever run through these columns because telephone men have reason to understand the meaning of size. Yet our English telephone friends of The Telegraph and Telephone Journal, failed absolutely to catch the idea.

If any American telephone man can see any levity and flippancy or any attempt at quasi humor in the story of May 22, I will buy him a big dinner during the next convention.

I am accused of actually exulting over the loss of this beautiful boat, when as a matter of fact I never was so angry over anything in my life. My simple questions as to the whereabouts of the largest navy in the world is called quasi humor. Yet the world knew that notice had been served that this ship would be attacked, even if the English people did not.

In this country it is an unwritten law that you can begin shooting at sight when your enemy, who has made open threats, appears.

Possibly some day our English friends will fully realize what General Sherman meant when he said war was hell—not a matter of law.

It is a hard game, trying to be neutral. I suppose official Germany holds the United States responsible for what the pro-English sympathizers say, while England charges us with what the pro-Germans say.

We are abused by both elements as being dollar chasing Yankees, yet no one has been discovered that did not have some money chasing instinct—Europeans first of all. Possibly dollar chasing is not in the class of mark chasing, franc pursuing or shilling saving, but it looks a great deal alike to men up trees anyway.

Whatever the attitude of Europe, we must be prepared for the worst—tell your congressman.

Another man has written a book. He has written well, and has no need of anything but pride in his work. I refer to Kempster B. Miller, who has just finished a report on the telephone situation in Chicago.

The report is a comprehensive one and reveals a most thorough study of a very difficult situation.

As you know, some men wanted to hold exclusive rights to a tunnel under Chicago. To get these rights they appealed to the prejudice of the people by asking for a telephone franchise. After getting a telephone franchise they proceeded to bore tunnels underneath designed to hold telephone cables. Soon the nigger in the woodpile appeared, for the permission was asked to enlarge the tunnels so that freight could be hauled.

It was soon found that enough freight to pay expenses could not be hauled through a tunnel, so they turned to the telephone to save their financial lives.

Upon 20,000 telephones was thrust the burden of paying fixed charges upon over $20,000,000, and naturally, it failed to carry this superhuman load.

Therefore the world hears a story of telephone failure which is not a telephone but a tunnel failure. The telephone part of it was never given a chance until it was too late, so make up your mind that corporations as well as men must be judged by the company they keep.

Mr. Miller found that the telephone patient is beyond recall. Neither city nor private corporation can give it the magic touch of life. Its asset possibilities are but junk. But what follows is the fine yet courageous suggestion—the only one of economic possibility:

"Its best course will be to permit the sale to the American Telephone & Telegraph Co., after taking full precautions by ordinance, by agreement or otherwise, to prevent the *undue inflation* of the amount upon which the Chicago Telephone Co. is to be allowed to earn a fair return."

This is the point: The survivor of a competitive conflict shall be allowed to buy the loser at a fair price. The public permitted this economic blunder and must be compelled to pay for it, and Mr. Miller wisely says at a fair price which will not punish the people for their mistake.

Every enterprise in competitive surroundings should have the right to sell if it finds that people no longer give it proper support. The buying company, in purchasing the unsuccessful property, merely acts as trustee for the purchase price and levies it on the public in a manner least oppressive.

MORAL: Books or articles are not written under oath.

Extension of Toll Service in Texas.

A metallic circuit is being constructed from San Angelo to Christoval, Eldorado and Sonora by the San Angelo Telephone Co., of San Angelo, Texas. When the new line is completed, residents of those places can secure connections with Dallas and Fort Worth.

"Telephony's" Home Study Course for Telephone Men

A Complete Presentation of the Principles Underlying Modern Telephony in All Its Branches—Arranged Systematically So That Regular Reading and Faithful Study Will Qualify Ambitious Men for Higher Positions—Prepared Under Supervision of Stanley R. Edwards—This Section Written by Jay G. Mitchell

Quiz Questions on the Preceding Installment.

211. Why must the limit of resistance for subscribers' loops be kept lower in common battery plants than in magneto plants?

212. Does the insertion of the condenser in the talking circuit affect the voice-carrying telephonic currents? What is the effect of the so-called "ring through" condenser which is sometimes used on heavy party lines of magneto exchanges?

213. What is the relation between the effect of capacity and the effect of inductance on the transmission of telephonic voice currents? Would the capacity of a telephone circuit be increased or diminished if the wires were spaced farther apart?

214. Are inductance and inductance reactance cause and effect?

215. What method is used to reduce the effect of capacity on telephonic transmission?

Practical Talks Just Among Ourselves.

Caleb Higbee was a very successful business man. He had the respect of the entire community in which he had begun his business life in the store now bearing his name over the door. The original structure had disappeared long ago, and in its place was a handsome plate glass front department store with skillfully arranged window displays, a basement bargain department and a modern restaurant.

Mr. Higbee was a member of the M. E. Church, one of the official board, and it was known that his ambition was to inject successful business methods into the church as he had in his own affairs. When the Independent telephone company built its plant, he was one of the first if not the only business man to forsee the inevitable importance of the telephone as an adjunct to his store.

His was the first enterprise in the city of Fosterburg to install a private branch exchange for the transaction of its business as well as for the convenience of its patrons. Attractive booths were located at various points and every convenience was provided to induce the use of the telephone. As a result, the ladies made the Higbee store their headquarters, while the uniformly courteous treatment insisted upon by Mr. Higbee from all his employes served to retain the trade secured.

The competing telephone company in self protection made a very liberal contract with Mr. Higbee. It installed one of its switchboards, and the telephone system became a very important part of the store's methods for serving the public. The Independent switchboard was large enough in every way for the number of stations installed, and it had plenty of cord pairs for the traffic of the first six months or so. However, the patrons of a drygoods store have a great amount of telephoning to do, and as every telephone man knows, their conversations are not the shortest in the world.

This occasionally brought on a condition very closely

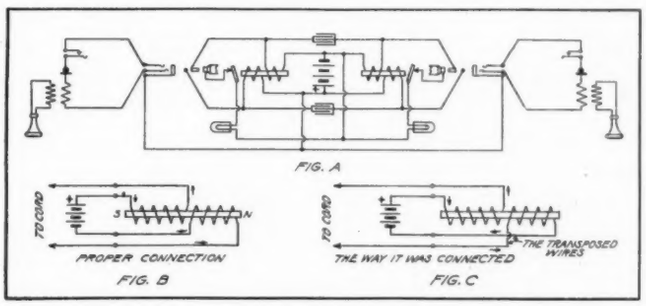


Fig. 89. The P. B. X. Circuit and the Relay Connections.

bordering on a lack of sufficient facilities and it had become the rule in the telephone office, to rush a man at the highest speed to the Higbee store whenever a report was received of cord trouble on the private branch exchange there. One cord out of order made things very disagreeable; two pairs drove the private branch operator frantic; and three brought a crisp letter from Mr. Higbee or a crisper call on the general manager of the telephone company.

When the last mentioned condition prevailed, the effect of Mr. Higbee's business methods was such that every one connected with the case moved with the greatest temporary activity.

Ordinarily in case of cord trouble, it was sufficient to change a cord, renew a lamp or adjust a key. But one time it happened that the ordinary remedies failed to produce results, and the troubleman returned to the office "stumped"; as he expressed the situation to the wire chief. "What does it do?" asked that dignitary after receiving the report.

"Well, the supervisory lamp lights as usual and the telephone bell rings when the ringing key is pulled. There is battery on the local station, but it is a little noisy and the supervisory lamp does not go out when the station answers. In fact, the supervisory relay does not pull up at all."

The wire chief dug the circuit of the switchboard out of his desk and, after studying it a few minutes, remarked that the supervisory relay would have to be changed and that he hoped to goodness that there was one in stock.

The circuit was like the one shown in Fig. 89-A. The troubleman asked to look at it as he had been reading

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TELEPHONY's Home Study Course and desired, if possible, to check up his own conclusions.

In a few minutes, the storekeeper, having returned with one of the relays (he said it was the only one on hand), the wire chief started for the Higbee store taking the troubleman along. With an electric soldering iron it was a short job to remove the relay. True to prediction, they found that the coils were charred and almost entirely short-circuited. The new relay was soldered in place and the wires carefully dressed up again (this wire chief was a stickler for neatness). They were so sure they had finished that they slid the switchboard back into the corner before testing out the cord.

What was their surprise to find the cord a little noisier than before, and operating in exactly the same way as before the defective relay was removed. Fortunately it was closing time before they finished and Mr. Higbee told them with the pleasantest smile in the world that the night watchman would let them out when the board was all right, and that he hoped nothing serious was the matter as the next day was bargain day and the telephones would be extra busy.

Of course all the connections were gone over, and every wire was buzzed out on the chance that a wire had been transposed on the terminals. But everything seemed correct. The wire chief took the relay out and tested each coil without finding the trouble as each one alone operated the armature perfectly when connected to battery. While he was doing this, the troubleman had been studying the circuit.

Being one of the kind who have some imagination, he asked: "How do we know that the current is circulating in both of these windings in the same direction around the core?"

Of course it was a foolish question for every wire chief knows that all coils are wound in the same direction and that the terminals of the windings are connected to the terminals of the relays in a routine way by people in the factory working under specifications. The troubleman seemed duly impressed by this fact when it was told him, but, while the wire chief began to draw circuits on paper, he connected two of the relay terminals to battery. Then he short-circuited two of the others and to his surprise the relay pulled up strongly.

When the wire chief heard the click of the relay, he reached over without a word and took the relay out of the troubleman's hands. After looking at it carefully for a few minutes, he said: "You have attached the battery to one of the battery terminals, and to one of the terminals leading to one of the wires of the cord. You have then connected a battery terminal and a cord wire terminal together and the relay operates."

By taking the relay to the light and tracing the wires, from the coils they found that one of the winding ends which should have been a battery wire terminal and the other winding end which should have been one of the cord wire terminals, had been transposed as shown in Fig. 89-C. This would cause the magnetic flux produced by the two separate windings of the relay, to be in opposition. The practical effect would be that one would neutralize the other; there would be no lines of force through the core and the relay armature would not be attracted when the local station answered.

It was all very plain then and the troubleman said that, inasmuch as it was late, they could clear the trouble by transposing a battery wire and a cord wire in the cable form on the relay terminals. The wire chief felt that his faith in the regularity of small things had been betrayed. However, as he was a careful and efficient man, he insisted on staying while they transposed the leading-in wires of one of the coils on the relay terminals. This left all the wires in the switchboard cable in their regular place as they should be.

On the way to the car he said to the troubleman: "Never leave any irregular connections in a switchboard cable, even if by so doing you can clear up your own case of trouble. You must always remember that if you do, the next man will suppose that you have left things connected properly and may spend valuable time locating the transposition that you left. He has no way of knowing the conditions as you have found them and will be confused at what he sees.

"The troublemen in whom the management have a special interest are the ones whose cases come back the most rarely. These men always clear their trouble but do it in such a way that the next man finds things normal in every way."

The next day, the stock repair room employes displayed interest in this case as it was a locally repaired relay and they promised not to let it occur again now that they understood how the magnetic polarity of electromagnets was determined

CHAPTER XI. The Common Battery Line Circuit (Cont'd).

216. *Insulation of the common battery line circuit.*—In insulation values, the common battery circuit imposes somewhat more exacting conditions than the local battery or magneto line. In the common battery line, the exchange battery is always connected to the circuit in series with battery feed reactances or relays. The circuit, therefore, must maintain its insulation without breaking down under the constant strain of the battery voltage. Since one terminal of the central office battery is grounded, there is also a strain on the insulation of the circuit between the wire and the earth.

It is comparatively easy to prevent any great amount of leakage between the two sides of the circuit or between the one side and the earth by proper methods of construction. When a fault in insulation develops for any reason, however, in a common battery circuit, the constant presence of the central office battery voltage on the line wires causes a constant and probably increasing flow of leakage current. The flow of current through the fault in the presence of moisture is very apt to increase the defect in the insulation through electrolytic action. For these reasons it is necessary to maintain a common battery plant in a better general condition as to insulation than would be required in the local battery or magneto plant.

217. *Difficulties of obtaining standards for telephone circuits.*—The telephone circuit, unlike almost all other electrical circuits, is required to transmit sufficient energy to afford satisfactory service at all times while the frequency of the impressed currents as well as the voltage are sure to vary through wide

limits. It was seen to be necessary to provide some means of making comparisons between different circuits as to their value for transmitting speech electrically. Since the frequencies and the entire character of the impressed electric waves might vary within wide limits, while the capacity and inductance of

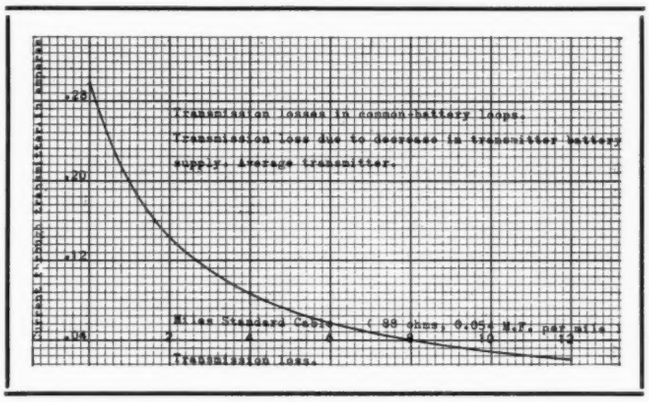

Transmission losses in common battery loops.
Transmission loss due to decrease in transmitter battery supply. Average transmitter.
Miles Standard Cable (88 ohms, 0.054 M.F. per mile
Transmission loss.

Fig. 90. Transmission Loss with Varying Battery Supply.

any two commercial circuits were almost sure to be different, it became very difficult to formulate an acceptable standard by which the value of the circuit could be gauged. Telephone engineers accordingly worked out the system of referring the transmission obtained under any given set of conditions with the transmission actually obtained under a certain well defined set of standard conditions.

In the standard conditions, the battery supply to the transmitter was fixed as well as the other arrangements. When it was desired to determine the value of any circuit for telephonic transmission, the standard circuit was employed and lengths of standard cable were inserted into the *standard circuit* until the transmission obtained over it was exactly equal to that obtained over the circuit under observation. If the conditions were such that ten miles of *standard* cable had to be inserted in the *standard* circuit in order to reduce the transmission over it to the same value as that obtained over the circuit under test, it was said that there was a loss of ten miles in the tested circuit.

218. *Transmission determination by comparison with standard cable.*—The standard cable comparison method lends itself readily to a fairly satisfactory determination of the *effectiveness* of any given set of circuit conditions. Fór instance, it is known just about how many miles of transmission loss will be caused by placing a 500-ohm ringer across a working telephone line. The loss to be expected when the battery supply to the common battery transmitter is varied above or below a definite figure, is shown in Fig. 90.

From this curve it would appear that the maximum result in transmission is obtained when the current through the transmitter is flowing at a strength of 0.297 amperes. According to the curve, the loss at this point is 0.0 miles. When the current has dropped to a strength of only 0.12 amperes, there is a loss in transmission of 2.33 miles according to the curve.

If the current should drop to a strength of 0.021 amperes, there is a loss, caused in transmission, of 12 miles. That is to say, the transmission in such a case is the same as that obtained over the *standard* circuit with twelve miles of the *standard cable inserted.* The standard cable used in this test has a resistance of 88 ohms and a capacity of 0.054 microfarads per mile.

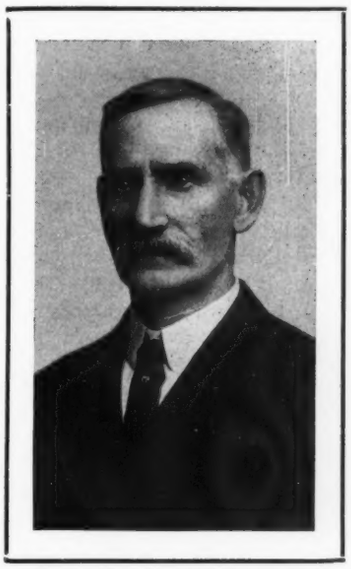
Tests have been carefully worked out for nearly all the circuit conditions that are likely to be encountered in practice, so that curves may be drawn to aid in the design of switchboard circuits and telephone lines of the greatest possible transmission effectiveness. The transmission loss produced by each standard piece of apparatus is therefore known with great exactitude. (*To be continued*).

Extensive Improvements to Meadsville (Pa.) Telephone Co.

The Meadville Telephone Co., of Meadville, Pa., has purchased a new two-story brick building on Market street to be used exclusively for the company's general offices and central office equipment. The company is now at work placing its wires in the business district underground. New equipment will be installed in the company's new exchange building, making the plant up to date in every respect.

PERSONAL ITEMS FROM THE FIELD.

N. G. HUNTER, of Wabash, Ind., on October 21, took the oath of office as judge of the 27th judicial circuit of the state of Indiana and judge of the Wabash circuit court of Indiana. On Friday, October 22, he mounted the bench and began the first day of his term as circuit judge, which will continue for the next six years.



Judge N. G. Hunter.

Judge Hunter is 67 years old and was born in Fulton county, Ind., November 3, 1847. His early life was passed in the typical pioneer fashion and at an early age he enlisted in company G, of the 17th regiment of Indiana volunteers and was honorably discharged in September, 1865.

In 1877 he began the study of law in the office of M. H. Kidd, and two years later was admitted to the bar before Judge Pettit. Mr. Hunter has formed several partnerships in the practice of law, the most noteworthy of which was formed with Hon. Warren G. Sayre, in 1903, and was dissolved only by the former's selection to the office of circuit judge.

Mr. Hunter was president of the National Independent Telephone Association during the year of 1914 and is well known in the telephone field.

M. L. MILLER, owner of the Ainsworth Telephone Co., at Ainsworth, Iowa, recently disposed of his property to C. K. Gray, of Centerville, who assumed full charge on October 15. Mr. Miller has operated the Ainsworth system for 15 years and has always given satisfaction. His future plans have not as yet been disclosed.

C. V. BRIDWELL, of Louisville, Ky., has been made manager of the Cumberland Telephone & Telegraph Co., at Henderson, Ky., succeeding F. J. Gorham, resigned.

GLENN HOWE, formerly manager of the Menomonie exchange of the Wisconsin Telephone Co., has been transferred to Eau Claire, where he will have charge of the company's plant. He succeeds J. E. Bonnell, who has been promoted to the office of manager of the Kenosha exchange.

From Factory and Salesroom

Conventions: Canadian, Toronto, Nov. 10-11; Missouri, Kansas City, Nov. 16-17; Ohio, Columbus, Nov. 18-19; Joint Convention of National Associations, Chicago, Dec. 8-10; South Dakota, Sioux Falls, Dec. 15-16; Minnesota, Minneapolis, Jan. 25-26; Wisconsin, Madison, Feb. 9-11

A Brief Outline of the Asbestos Industry.

Fifty years ago there was practically no asbestos industry. Today the yearly output runs well up into the millions of dollars in America alone, while every civilized community in the world uses the mineral in various forms.

Although we have ample evidence that this material was known and used by the versatile Egyptians and their long-buried contemporaries, it was almost forgotten for many thousands of years, until in quite recent times the advent of high pressure steam brought the need for a material which would resist higher temperatures than anything then in use.

Attention was therefore directed to the large deposits of asbestos known to exist in Canada, particularly in the eastern townships of Quebec province. This region is today the principal and almost the sole source of supply for the world's consumption, as although asbestos is found in many other countries, it is either unsuitable for manufacturing purposes or else the difficulties of mining and transportation have tended to greatly restrict the output.

The history of Canadian asbestos mining may be almost described as a chapter of accidents. But for the burning away of the forests and the subsequent denudation of the over-lying strata of soil and gravel, it is highly probable that the existence of asbestos deposits would never have been even remotely suspected.

Asbestos lies in veins or pockets varying in width from ½ inch to 4½ inches, sandwiched in between layers of hard, semi-volcanic serpentine, which in this particular section is exposed on the surface of the ground at many points.

Owing to the irregularity of the veins, mining by means of shaft or tunnel is practically impossible and the open quarry system is almost universal, despite the drawbacks incidental to bad weather and the long winter season.

The extraction of the asbestos involves the removal of a great deal of valueless serpentine rock. Frequently as much as ten or even twenty tons of waste is removed to secure one ton of asbestos ore. This naturally adds considerably to the cost of the finished product.

The crude asbestos, as mined, is a tough block often containing numerous impurities, such as sand, rock, traces of iron and other metals. All of these must be removed before the actual manufacturing stage is reached.

From the floor of the mine the crude material is conveyed by a cable-way to the ore bins, where it is roughly sorted into various grades.

The finest pieces are first hand-treated with hammers, which removes the external impurities. This process is known as "cobbing." The lower grades are sent direct to the crusher, following which in both instances they go through the following additional processes:

Crushing by powerful machinery of the Blake or rotary types.

Drying by centrifugal machinery to extract the superfluous moisture.

Fiberizing or breaking up the fibre into threads in similar manner to the beating of flax and hemp.

The fiberized asbestos goes thence to a "cyclone," which stirs it up, agitates it violently with blasts of air and in the end tosses the lighter silkier fibres one way and the coarser ones another, while the dust and refuse fall out below.

From the "cyclone" the fine fibres drop into a shaker, which further agitates and separates them. Thence they are lifted by powerful fans. The finer particles traveling farthest are caught in one compartment while the less fine are separated into various grades. This completes the milling process and the crude asbestos is now ready for manufacturing purposes.

Chemically, asbestos is a silicate of magnesia, with slight traces of other minerals, combined with a variable percentage of water. The larger the proportion of combined water the longer and more flexible are the fibres. It is this quality which makes the Canadian asbestos superior to any other.

Asbestos possesses a faculty unique among minerals, that of being spun and woven into thread and cloth. It is also capable of being felted, but unlike all organic fibres which are tubular in their formation and therefore easily twisted without breaking, asbestos is non-tubular and for a long time this threatened to be a stumbling block in the way of its manufacture into textiles.

It is certain the ancients overcame this trouble by mixing a vegetable fibre with the asbestos, but for modern purposes this is impossible. The difficulty has now been successfully overcome by special machinery, so that asbestos is now spun into thread, twisted into cord of considerable strength and woven into a variety of fabrics.

The list of possibilities of asbestos manufacture is far from being exhausted by textiles.

The engineer is indebted to it for packings, for valves, pistons and joints, non-conducting coverings for boilers, pipes, steam chests, and all heated surfaces, brake blocks, stack and flue ducts and linings and a variety of minor articles. Wherever heat begins to show a tendency to become unruly, asbestos can be depended upon to curb it.

The electrician and electrical engineer owe a great deal to the introduction of asbestos because it is the base of many of the best non-conductors of electricity yet discovered.

More recently, under the name of "Transite" and "Transite Ebony" the H. W. Johns-Manville Co. has introduced two kinds of asbestos "wood," which is being largely used for switchboard purposes and a variety of other electrical uses, including station, street car and railway paneling, and flooring, telephone and motion picture booths, etc., for which its ease of working, lightness and fireproof qualities make it specially suited.

It is today almost possible to build a fireproof asbestos house.

At any rate the ordinary house may be walled, ceiled, floored and roofed with asbestos boards, shingles and felts, while all fireproof roofings have a basis of asbestos.

Asbestos is used also as a siding for bungalows, garages and other small buildings.

Larger houses are plastered with asbestos stucco, roofed with asbestos shingles (which may also be used as siding) and may be painted with fireproof asbestos paint.

By combination with various asphalts and portland or hydraulic cement, its field is greatly widened and a great number of additional products are added to the list.

The field for asbestos products is being constantly widened by modern industrial expansion. Its marvelous adaptability and its powers of resistance to heat, oil, wa-

ter and acids, combined with a capacity for almost indefinite wear, fully entitle it to claim the title of "the mineral of many marvels."

The H. W. Johns-Manville Co., of New York City, was one of the earliest to recognize the immense future possibilities of asbestos, and from the first days of the industry this firm has been prominently identified with the growth and development of the modern demand for asbestos products.

Paragraphs.

THE CARBO STEEL POST CO., of Chicago, has changed its name to "The Carbo Corporation." No change in the company's personnel has been made. Expansion of the company's business from its primary trade in the manufacture of telephone poles and fense posts into the manufacture of fence supporting systems, power poles, lighting systems and various types of utilities made of steel for use in construction of small buildings, has been the cause of the change of the name of the company.

JOHN W. COFFEY, of the Coffey System & Audit Co., Indianapolis, Ind., was a caller at TELEPHONY's offices early this week. Mr. Coffey reports a growing interest in telephone accounting and especially in auditing. The Coffey System & Audit Co. now makes yearly audits for a number of companies, while other companies want semi-annual and quarterly audits. A few companies have even gone so far as to call upon the company to make monthly audits. The business of the company is rapidly increasing.

V. C. STEINBERGER, general manager of the General Insulate Co., manufacturer of telephone receiver cases, mouthpieces, etc., 1007-1015 Atlantic Avenue, Brooklyn, N. Y., was in Chicago last week on his way East, after an extended trip through the Western and Pacific Coast country. During his absence of four weeks, Mr. Steinberger traveled 9,000 miles, visited both the expositions in California, Yellowstone Park, Yosemite and the Grand Canyon, and besides, called upon the many users of General Insulate apparatus which include the leading telephone companies of the West.

He informs TELEPHONY that he found business conditions in the telephone field much improved, not only on the coast but at Kansas City, Omaha, St. Louis and other cities where he made stops while traveling East. "I was very much pleased to find the telephone companies doing so well," said Mr. Steinberger. "The future looks bright for the industry."

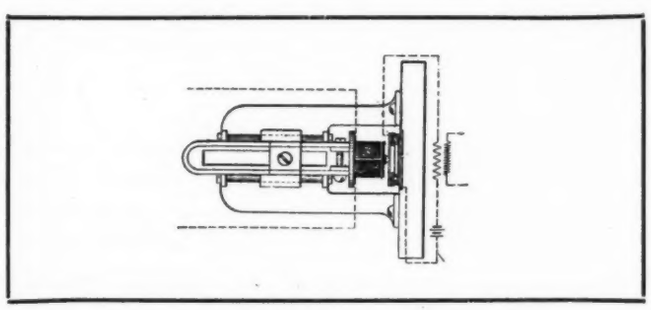
Assessment of A. T. & T. Co. in Oklahoma.

The American Telephone & Telegraph Co. has been assessed by the Oklahoma state board of equalization at $500,000, $300,000 for the lines operated in the state and $200,000 for transmitters and receivers rented to the Pioneer (Bell) Telegraph & Telephone Co.

Record of Telephone Patents Recently Issued

1,154,069. September 21, 1915. AUDIPHONE; C. Soret, Havre, France. This magnetic audiphone is of the double receiver type in that two audiphones are supported upon a head band. Each is comprised of a receiving microphone and transmitter in combination.

1,154,075. September 21, 1915. TELEPHONE SYSTEM; J. A. Taggart, Rochester, N. Y.; assigned to Stromberg-Carlson Telephone Mfg. Co. The feature of this multi-office telephone system is the provision of an automatic trunking switch which is controlled by a supervising relay.



No. 1,154,574. Repeater.

1,154,139. September 21, 1915. TELEGRAPH OR TELEPHONE RELAY; C. Stille, Zehlendorf, Berlin, Germany. Two coils are suspended in a strong magnetic field of an electromagnet and adapted to be rotated in opposite directions by a change in the strength of the field. A plurality of fixed microphones are each subjected to the pressure of symmetrically arranged arms carried by the coils.

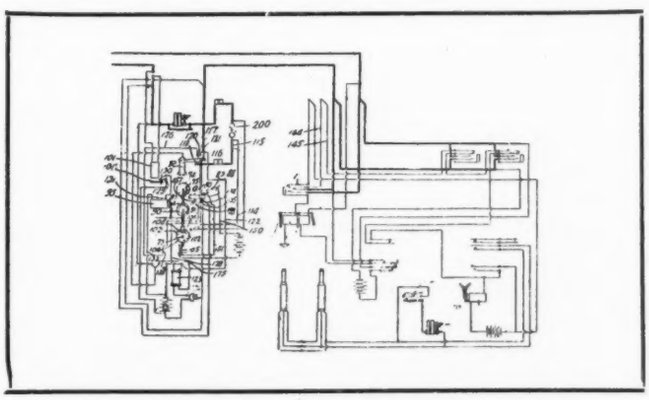
1,154,250. September 21, 1915. OPERATOR'S CALLING DEVICE; W. Kaisling, Chicago; assigned to Kellogg Switchboard & Supply Co. Impulse mechanism provided with terminals supported on top of the rear end of a rectangular elongated base has a keyboard which carries the impulse control keys. Keys are provided with terminals supported on angularly disposed parts of the base. Connections extend from the terminals of the keys to the impulse mechanism. The impulse mechanism has spring motor driven means and a winding magnet controlled by the keys.

1,154,319. September 21, 1915. CABLE HANGER; J. Kennedy, New York; assigned to the Clements Co., New York. A band is adapted to partially surround the cable and is provided with a U-shaped slot and a hooked portion arranged to engage a wire. The hook part is provided with a laterally projecting tongue having wings arranged to be passed through the slot and to lock the clamp in position.

1,154,480. September 21, 1915. FIRE ALARM; R. L. Brinkley, Winston-Salem, N. C. This fire alarm comprises a telephone and a normally idle graphophone. When set in motion, the phonograph is adapted to announce to the telephone the location of the fire.

1,154,574. September 21, 1915. REPEATER; C. D. Lanning, Dorchester, Mass. The feature of this repeater is a variable resistance medium which is comprised of an annular electrode having a convex surface and a co-operating annular electrode having a concave surface of greater curvature, the convex and concave surfaces beating one upon the other. An armature in magnetic relation to a magnet in a receiving circuit is connected with one of the electrodes to vary the pressure contact between them and hence the conductivity.

1,154,700. September 28, 1915. TELEPHONE APPARATUS; A. J. Kempien, St. Paul, Minn. This equipment is designed to prevent unauthorized use of a telephone. An auxiliary device, which is hand operated, is installed in a branch circuit at the subscriber's station. It is adapted to influence the operation of a signal connected with the cord circuit of the central office.



No. 13,989. Selective System.

1,154,929. September 28, 1915. SIGNALING SYSTEM; O. M. Leich, Genoa, Ill., and C. E. Hague, Rochester, N. Y.; assigned to Kellogg Switchboard & Supply Co. Relates to an automatic exchange system for party line telephones. Electro-

magnetic mechanism is provided for associating the ringing mechanism with multiple line contacts in the exchange. Provision is made for causing a line to test busy when in use and to prevent connection with it. Means are also provided to suspend the operation of the busy switch contacts when a calling party line subscriber calls another party on the same line.

13,989 (Reissue 1,061,825. May 13, 1913). September 28, 1915. SELECTIVE SYSTEM OF TELEPHONY; R. C. M. Hastings, Columbus, Ohio; assigned to International Telephone Co., Columbus, Ohio. Mechanism is installed at the exchange so that the operator may select the desired station, signal it and shunt all the uncalled stations from the system. At each instrument, a receiver hook lock is installed and means are controlled by the selecting device to cause the lock to be engaged or free.

1,155,640. October 5, 1915. IMPULSE TRANSMITTER FOR SELECTIVE SYSTEM; G. Brown, Brooklyn, N. Y.; assigned to Western Electric Co. Contact springs are arranged to be engaged by the teeth of a rotatable tooth wheel to make and break a circuit.

1,155,672. October 5, 1915. TELEPHONE EXCHANGE SYSTEM; T. G. Martin, Chicago; assigned to Automatic Electric Co. The feature of this automatic telephone system is the provision of means whereby intercommunication may be carried on between parties on the same line. A resistance prevents actuation of the line switch when a person desires to talk with another person on the same line. When a party on another line is desired, the resistance may be short-circuited and thus actuation of the line switch brought about.

1,155,722. October 5, 1915. FIRE ALARM SYSTEM; F. Gottschalk, Stirling, N. J. A mechanical device, arranged to produce sound signals, is placed in proximity to a telephone instrument. Spring operated means are attached to the telephone instrument in such a way as to be in connection with the receiver hook. A fusible link holds the switching mechanism from operating and when melted by the presence of abnormal heat releases it and pushes up the receiver thus sending in the signal to the central operator.

1,156,157. October 12, 1915. RECEIVER; O. M. Leich, Genoa, Ill.; assigned to Cracraft, Leich Electric Co. A direct current receiver is described. The diaphragm is associated with the periphery of a cup of magnetic material. An electromagnet is secured to the cup and connections made with the external circuit at a bridge secured rearwardly of the cup.

1,156,253. October 12, 1915. TELEPHONE SYSTEM; L. W. Stanton, Cleveland, Ohio; assigned one-half to F. W. Dunbar, Chicago. In this semi-automatic system, operators' telephone sets are arranged for automatic connection to calling circuits. Means are provided to indicate to the calling parties when the operators are ready to receive orders. After the receipt of the order, the operators are automatically disconnected from the lines. There are 81 claims to this patent.

1,156,352. October 12, 1915. SELECTIVE SYSTEM AND APPARATUS; J. F. Engle, Cleveland, Ohio. The substations on a party line are each equipped with a permutating switch comprising a plurality of separable contacts, through each of which a signaling circuit is adapted to close in series relation. An electromagnet is controllable over one line conductor and operates means for effecting the actuation of the permutating switch. A second electromagnet, controlled over the other line conductor, operates means for modifying the electrical relation of the permutating switch contacts.

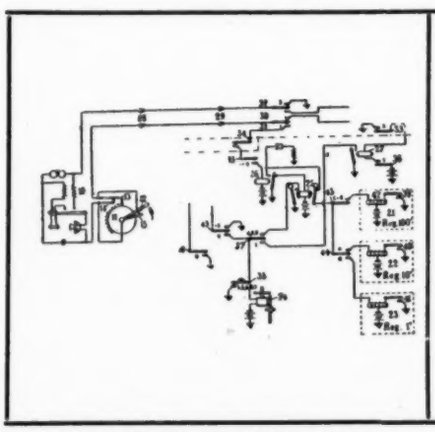
1,156,416. October 12, 1915. TELEPHONE EXCHANGE SYSTEM; F. R. McBerty, New Rochelle, N. Y.; assigned to Western Electric Co. In this automatic telephone system a variably operable, power-driven switch is adapted to be moved under the control of a single contact of a relay in an impulse receiving circuit. A local circuit controlled by the switch itself is adapted to stop a switch after it has moved a definite distance.

1,156,450. October 12, 1915. CORD CIRCUIT FOR TELEPHONE SYSTEMS; B. D. Willis, Chicago; assigned to Automatic Electric Co. The feature of this cord circuit for a semi-automatic system is the provision of a relay, bridged across the cord circuit, through the springs of which a coil of a second relay is normally short-circuited. Means are controlled by the second relay, when energized, to maintain the short-circuit open.

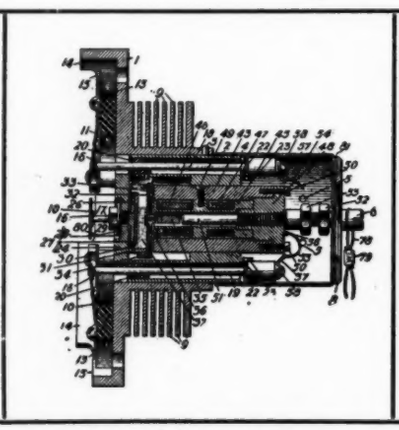
1,156,475. October 12, 1915. AUTOMATIC TELEPHONE EXCHANGE SYSTEM; C. L. Goodrum, New York; assigned to Western Electric Co. Automatic connective means, common to all subscribers on a party line, are provided so that the line may be connected with other lines as determined by any one of the subscribers. Other automatic connective means are associated with the first mechanism but individual to the several subscribers on the line, whereby any one subscriber can be selected and called to the exclusion of others.

1,156,509. October 12, 1915. MICROPHONE; E. Weintraub and L. B. Miller, Lynn, Mass.; assigned to General Electric Co. The feature of this microphone is the provision of a cell containing conductive carbon made by carbonizing a resinous phenolic condensation product and being hard enough to scratch glass.

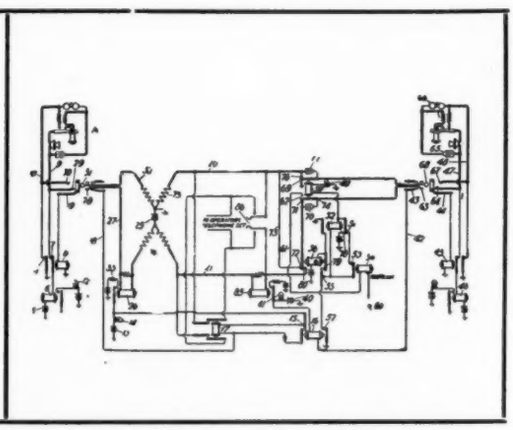
1,156,626. October 12, 1915. TELEPHONE SYSTEM; R. L. Quass, New York; assigned to Western Electric Co. The feature of this common battery system is the provision of means for automatically applying ringing current to the called lines upon connecting normally open link conductors to it. Provision is made for automatically removing ringing current from the called line while means associated with the link conductors are actuated after the removal of the ringing current for closing the normally open link conductors.



No. 1,156,626. Telephone System.



No. 1,156,636. Repeater.



No. 1,156,416. Exchange System.

1,156,636. October 12, 1915. TELEPHONE REPEATER; H. E. Shreeve, Short Hills, N. J.; assigned to Western Electric Co. In this repeater a granular transmitter is placed in operative relation to an electromagnetic receiver. A thermostatic diaphragm forms one wall of the granular chamber. A local circuit includes a magnetizing winding of the receiver and the transmitter. The thermostatic diaphragm and the magnetizing winding are arranged and adapted jointly to relieve the pressure on the granules of the transmitter upon a tendency thereof to pack, by causing the diaphragm to bow inwardly.

1,156,671. October 12, 1915. ELECTROMAGNETIC RELAY; E. B. Craft, Hackensack, N. J.; assigned to Western Electric Co. This relay consists of a flat core and a flat flexible mounted U-shaped armature. The core and the armature are arranged flatwise in substantially the same plane.

1,156,867. October 12, 1915. UNIVERSAL SOUND TRANSMITTING MEANS; P. J. Hackett, Seattle, Wash.; assigned to Universal High Power Telephone Co. This sound transmitting device consists of a plurality of sound tubes and a diaphragm for each tube. A granular resistance cell is affixed to each diaphragm. A fixed and a movable electrode within each of the cells act so that the granules associated with one diaphragm of each pair of oppositely disposed pairs of diaphragms only are compressed by the outward swelling of that diaphragm, while the corresponding granules of the other diaphragm of that pair are allowed to move away from each other.